N00102.AR.002700
NSY PORTSMOUTH
5090.3a

FINAL REMEDIAL INVESTIGATION REPORT OPERABLE UNIT 9 (OU9) NSY PORTSMOUTH ME

6/1/2012

TETRA TECH

Final
Remedial Investigation Report for Operable Unit 9

Portsmouth Naval Shipyard

Kittery, Maine

Naval Facilities Engineering Command Mid-Atlantic

Contract Number N62470-08-D-1001
Contract Task Order WE26

June 2012

121015/P

FINAL

REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9

FOR

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command Mid-Atlantic
9742 Maryland Avenue
Norfolk, Virginia 23511-3095

Submitted by:
Tetra Tech
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

CONTRACT NO. N62470-08-D-1001
CONTRACT TASK ORDER WE26

JUNE 2012

PREPARED UNDER THE DIRECTION OF:

DEBORAH J. COHEN, P.E.
PROJECT MANAGER
TETRA TECH
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMISSION BY:

JOHN J. TREPANOWSKI, P.E.
PROGRAM MANAGER
TETRA TECH
KING OF PRUSSIA, PENNSYLVANIA

REVISION LIST

Section	Revision	Description
Cover	Revision 0; June 2012	The Cover was updated to reflect the final document dated June 2012.
Navy Final Remedial Investigation for Operable Unit 9 Signature Page	Revision 0; June 2012	The Navy signature was signed and updated to indicate the document is final as of June 2012.
Maine Certified Geologist Signature page	Revision 0; June 2012	The Maine Certified Geologist Certification Page was updated to include a Maine Certified Geologist signature and seal.
Table of Contents	Revision 0; June 2012	The title of Appendix E was updated.
Acronyms and Abbreviations	Revision 0; June 2012	The page numbers were updated to account for insertion of the revision list.
Appendix B	Revision 0; June 2012	The third paragraph was revised as provided in the response to MEDEP follow-up comments on the draft document provided May 2, 2012 included in Appendix E.
Appendix E – Responses to Comments	---	The responses to MEDEP follow-up comments on the draft final document were included in Appendix E. Appendix E flysheets were updated.

This page intentionally left blank.

MAINE CERTIFIED GEOLOGIST
CERTIFICATION PAGE

By affixing my seal, I certify that the geologic data and interpretations stated in this *Remedial Investigation Report for Operable Unit 9 for Portsmouth Naval Shipyard, Kittery, Maine*, dated June 2012, are true and accurate to the best of my knowledge. I further certify that I am licensed to practice geology in the State of Maine and that it is within my professional expertise to verify the correctness of this information.

STATE OF MAINE
TIMOTHY S. EVANS
GE505
GEOLOGIST

Timothy S. Evans, C.G.
Certificate Number GE505

6/1/12
Date

TABLE OF CONTENTS

SECTION		PAGE NO.
REVISION LIST		**iii**
MAINE CERTIFIED GEOLOGIST SIGNATURE PAGE		**v**
ACRONYMS AND ABBREVIATIONS		**xi**
EXECUTIVE SUMMARY		**ES-1**
1.0	**INTRODUCTION**	**1-1**
1.1	PURPOSE AND SCOPE OF REPORT	1-1
1.2	REPORT ORGANIZATION	1-2
1.3	FACILITY AND OU9 DESCRIPTION AND HISTORY	1-3
1.3.1	Facility Description and History	1-3
1.3.2	OU9 Description and History	1-4
1.4	SUMMARY OF ENVIRONMENTAL REPORTS AND ACTIONS AT OU9	1-5
1.5	POTENTIAL SOURCES OF CONTAMINATION AT OU9	1-7
2.0	**STUDY AREA INVESTIGATION**	**2-1**
2.1	REMEDIAL INVESTIGATION	2-1
2.2	DATA USABILITY	2-1
3.0	**SITE CHARACTERIZATION**	**3-1**
3.1	DEMOGRAPHY AND LAND USE	3-1
3.2	SURFACE FEATURES	3-2
3.2.1	Shoreline Protection	3-3
3.3	SOILS	3-3
3.4	GEOLOGY	3-4
3.4.1	Regional Geology	3-4
3.4.2	OU9 Geology	3-5
3.4.3	Summary of OU9 Geology	3-9
3.5	HYDROGEOLOGY	3-9
3.5.1	Portsmouth Naval Shipyard General Hydrogeology	3-10
3.5.2	OU9 Hydrogeology	3-11
3.6	SURFACE WATER USE AND HYDROLOGY	3-11
3.7	ECOLOGY	3-13
3.8	CLIMATOLOGY	3-13
4.0	**NATURE AND EXTENT OF CONTAMINATION**	**4-1**
4.1	SURFACE SOIL CONTAMINATION	4-1
4.2	SUBSURFACE SOIL CONTAMINATION	4-2
5.0	**CONTAMINANT FATE AND TRANSPORT ANALYSIS**	**5-1**
5.1	PHYSICAL AND CHEMICAL PROPERTIES	5-1
5.1.1	Polycyclic Aromatic Hydrocarbons	5-1
5.1.2	Lead	5-2
5.1.3	Antimony	5-3
5.1.4	Mercury	5-3

TABLE OF CONTENTS (Continued)

SECTION **PAGE NO.**

5.2 CONCEPTUAL SITE MODEL OF CONTAMINANT MIGRATION 5-3
5.2.1 Potential Contaminant Migration Pathways 5-4
5.2.2 Potential Exposure Routes and Receptors 5-4
5.3 CONTAMINANT FATE AND TRANSPORT SUMMARY 5-5

6.0 HUMAN HEALTH RISK ASSESSMENT 6-1
6.1 RISK ASSESSMENT PROCEDURES 6-1
6.2 DATA EVALUATION 6-5
6.2.1 Data Usability 6-5
6.2.2 Selection of Chemicals of Potential Concern 6-6
6.3 EXPOSURE ASSESSMENT 6-9
6.3.1 Exposure Setting 6-9
6.3.2 Potential Receptors 6-11
6.3.3 Exposure Pathways 6-11
6.3.4 Exposure Point Concentrations 6-12
6.3.5 Quantification of Exposure 6-13
6.4 TOXICITY ASSESSMENT 6-14
6.4.1 Toxicity Criteria for Oral and Inhalation Exposures 6-14
6.4.2 Toxicity Criteria for Dermal Exposure 6-15
6.4.3 Toxicity Criteria for Carcinogenic Effects of PAHs 6-16
6.5 RISK CHARACTERIZATION 6-16
6.5.1 Carcinogenic Effects 6-17
6.5.2 Non-Carcinogenic Effects 6-18
6.5.3 Quantitative Risk Estimates – Reasonable Maximum Exposure Evaluation 6-18
6.5.4 Exposure to Lead from Site Sources 6-21
6.5.5 Background Risks 6-21
6.6 UNCERTAINTY ANALYSIS 6-23
6.6.1 Uncertainty in Selection of Chemicals of Potential Concern 6-24
6.6.2 Uncertainty in the Exposure Assessment 6-25
6.6.3 Uncertainty in the Toxicological Evaluation 6-30
6.6.4 Uncertainty in the Risk Characterization 6-32
6.6.5 Deviations from the Work Plan 6-33
6.7 SUMMARY AND CONCLUSIONS 6-34
6.7.1 Summary of Risks – Risk Characterization 6-34
6.7.2 Summary of Risks – Uncertainty Analysis 6-36
6.7.3 Human Health Risk Assessment Risk Drivers 6-37

7.0 SUMMARY AND CONCLUSIONS 7-1
7.1 SUMMARY 7-1
7.1.1 Nature and Extent of Contamination 7-1
7.1.2 Fate and Transport of Contaminants 7-1
7.1.3 Risk Assessment 7-2
7.2 CONCLUSIONS AND RECOMMENDATIONS 7-4
7.2.1 Conclusions 7-4
7.2.2 Recommendations 7-5

REFERENCES R-1

TABLE OF CONTENTS (Continued)

APPENDICES

A SUPPORTING INFORMATION
- **A.1 SUMMARY OF OU9 BORING DATA AND PERCENT ASH CALCULATIONS**
- **A.2 SOIL BORING LOGS**
- **A.3 CONCENTRATION CROSS-SECTION FIGURE**
- **A.4 PRE AND POST EXCAVATION AS-BUILT FIGURES**

B BACKGROUND COMPARISON

C HUMAN HEALTH RISK ASSESSMENT SUPPORTING INFORMATION
- **C.1 RAGS-PART D TABLES**
- **C.2 EXPOSURE ASSESSMENT AND EXAMPLE CALCULATIONS**
- **C.3 ADDITIONAL RISK ESTIMATES**

D ANALYTICAL RESULTS - OU9 DATABASE PRINTOUT

E RESPONSE TO COMMENTS
- **E.1 RESPONSE TO COMMENTS ON DRAFT REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9**
- **E.2 RESPONSE TO COMMENTS ON DRAFT FINAL REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9**

TABLES

NUMBER

2-1 Summary of Sampling and Analytical Program
4-1 Summary Statistics for Surface Soil
4-2 Summary Statistics for Subsurface Soil
6-1 Summary of Cancer Risks and Hazard Indices Reasonable Maximum Exposures Using Unweighted EPCs
6-2 Risk Summary Table Using Unweighted EPCs
6-3 Summary of Cancer Risks and Hazard Indices Reasonable Maximum Exposures Using EPCs Weighted 90 Percent Excavated and 10 Percent Unexcavated Area
6-4 Risk Summary Table Using EPCs Weighted 90 Percent Excavated Area and 10 Percent Unexcavated Area
6-5 Summary of Cancer Risks and Hazard Indices Reasonable Maximum Exposures Using EPCs Weighted 5 Percent For Soils Containing Ash/Burnt Material and 95 Percent for Remaining Site Soils
6-6 Risk Summary Table Using EPCs Weighted 5 Percent For Soils Containing Ash/Burnt Material and 95 Percent for Remaining Site Soils

FIGURES

NUMBER

1-1 Location Map
1-2 Site Layout
1-3 Pre-Removal Action Ash Thickness
2-1 Post-Removal Action Borings
3-1 Cross Section Locations
3-2 Geological Cross Section A-A'
3-3 Geological Cross Section B-B'
3-4 Geological Cross Section C-C'
3-5 Geological Cross Section D-D'
3-6 Geological Cross Section E-E'
3-7 Geological Cross Section F-F'
4-1 Lead Exceedances of Screening Levels in Surface Soil Samples
4-2 Polycyclic Aromatic hydrocarbon Exceedances of Screening levels in Surface Soil Samples
4-3 Lead Exceedances in Subsurface Soil Samples
4-4 Mercury Exceedances of Screening Levels in Subsurface Soil Samples
4-5 Polycyclic Aromatic Hydrocarbon Exceedances of Screening Levels in Shallow Subsurface Soil Samples
4-6 Polycyclic Aromatic Hydrocarbon Exceedances of Screening Levels in Intermediate Subsurface Soil Samples
4-7 Polycyclic Aromatic Hydrocarbon Exceedances of Screening Levels in Deep Subsurface Soil Samples
5-1 3D Conceptual Site Model
5-2 Block Diagram Conceptual Site Model

ACRONYMS AND ABBREVIATIONS

ABS	absorption efficiencies
ADAFs	Age dependant adjustment factors
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
CAL EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIA	Controlled Industrial Area
CLEAN	Comprehensive Long-Term Environmental Action Navy
COCs	Contaminants of Concern
COPC	Chemical of Potential Concern
CSF	Cancer slope factor
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
CTO	Contract Task Order
DMR	Department of Marine Resources
DoD	Department of Defense
DQR	Data Quality Review
EE/CA	Engineering Evaluation/Cost Analysis
EPCs	Exposure point concentrations
EU	exposure unit
FFA	Federal Facility Agreement
FS	Feasibility Study
ft	feet
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HSWA	Hazardous and Solid Waste Amendment
HQ	Hazard Quotient
IAS	Initial Assessment Study
IEUBK	Integrated Exposure Uptake Biokinetic
ILCRs	Incremental Lifetime Cancer Risks
IRP	Installation Restoration Program
IUR	inhalation unit risk
JEE	Johnson and Ettinger Vapor Intrusion Model
MEDEP	Maine Department of Environmental Protection

mg/kg	milligrams per kilogram
MHW	mean high water
MS-01	Monitoring Station-01
NAD	North American Datum
NAVFAC	Naval Facilities Engineering Command
NCEA	National Center for Environmental Assessment
NERP	Navy Environmental Restoration Program
NHDES	New Hampshire Department of Environmental Services
NHPA	National Historic Preservation Act
NPL	National Priorities List
NOAA	National Oceanic and Atmospheric Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	Polycyclic aromatic hydrocarbon
PCB	Polycholorinated biphenyl
PNS	Portsmouth Naval Shipyard
PPRTVs	Provisional Peer Reviewed Toxicity Values
PPT	Parts per thousand
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RfC	reference concentration
RfD	reference dose
RFI	RCRA Facilities Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
RSL	Risk Screening Level
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act
SMP	Site Management Plan
SSI	Site Screening Investigation
SSL	Soil Screening Level
SVOC	Semi-volatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TEF	Toxicity Equivalency Factor

TRW	Technical Review Workgroup
TtNUS	Tetra Tech NUS
Tt	Tetra Tech
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
µg/kg	micrograms per kilogram

EXECUTIVE SUMMARY

This Remedial Investigation (RI) Report for Operable Unit (OU) 9 at Portsmouth Naval Shipyard (PNS), Kittery, Maine, was prepared by Tetra Tech NUS, Inc. (Tetra Tech) for the United States Department of the Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62470-08-D-1001, Contract Task Order (CTO) WE26. OU9 consists of Site 34 – Former Oil Gasification Plant. This RI Report was prepared to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by Superfund Amendments and Reauthorization Act (SARA).

The purpose of the RI Report for OU9 is to; 1) characterize the nature and extent of contamination and (2) evaluate the potential risks to human receptors. OU9 is in a currently and historically industrial area with no onshore ecological habitats; therefore, potential onshore ecological risks were not evaluated. Current and future potential for offshore migration of contaminants from the site via groundwater discharge to the offshore was not evaluated as part of the RI Report for OU9 because site contamination is in soils above bedrock and no overburden groundwater is present at OU9; therefore, site contaminants do not contact groundwater. Leaching of contaminants to groundwater is not a concern because the site contaminants have relatively low water solubilities and typically bind to site soils and are relatively immobile. Historical information for OU9 indicated there were past releases of contamination in the offshore area via erosion of contaminated soils; however, in 2007 erosion controls were put in place during an interim soil removal action. Offshore impacts from these past releases are being addressed under OU4 and are outside the scope of this report.

The operations that resulted in the release of contamination at OU9 were oil gasification and blacksmithing. Coal (fuel) combustion during the oil gasification process and during blacksmithing activities led to the generation of ash. Ash mixed with clinkers (metallic impurities from burnt coal), assumed to be from the combustion of coal (and potentially including ash from the 1919 building fire), was piled primarily north of Building 62. The ash pile was eventually buried and in 2007 the majority of that ash pile was excavated and disposed of at a hazardous waste facility. Residual ash in subsurface soils from past operations is the source of soil contamination at OU9.

Soil data were evaluated, the nature and extent of contamination were defined, and risks associated with the site were determined. Site soils were determined to be mostly (approximately 95 percent based on estimates from boring logs) 2007 backfill material and native and reworked soil. Approximately 5 percent of site soils are estimated to be mixed with ash or burnt materials. Polycyclic aromatic hydrocarbons (PAHs), antimony, lead, and mercury were detected in soil samples. Generally, the presence or absence

of ash indicates whether PAH contamination will be present at concentrations greater than industrial levels.

The human health risk assessment evaluated potential risks for current land use conditions and potential future land use conditions for the entire site under three different exposure point concentration (EPC) scenarios. The first set of EPCs calculated were not weighted (most conservative method and are included in the report to assist with risk management decisions), the second set were weighted 90 percent for the excavated area and 10 percent for the unexcavated area per the Sampling and Analysis Plan for Operable Unit 9 Remedial Investigation (Tetra Tech, July 2009), and the third set were calculated by weighting site soils containing ash and burnt material at 5 percent and remaining site soils at 95 percent (most representative of the site conditions based on the conceptual site model).

Potentially unacceptable non-carcinogenic health effects are not anticipated for any of the receptors for any of the risk evaluations conducted.

Adverse risks were not calculated for current and future recreational users, occupational workers, future residents, and current and future construction workers hypothetically exposed to surface soil. Potentially unacceptable risks were calculated for the current and future occupational worker, future child recreational user, future lifetime recreational user (child and adult), future child resident, future adult resident, and future lifetime resident (child and adult) exposed to subsurface soil. Carcinogenic PAHs associated with ash and burnt materials are the risk drivers in subsurface soils.

The Navy recommends that the FS Report for OU9 be prepared to address potentially unacceptable human health risks posed by exposure to carcinogenic PAHs in subsurface soil. The Navy recommends that remedial action objectives be developed for the portion of OU9 (subsurface soil) that potentially poses unacceptable risks to future hypothetical residents, child recreational users, and occupational workers.

1.0 INTRODUCTION

This Remedial Investigation (RI) Report for Operable Unit (OU) 9, at Portsmouth Naval Shipyard (PNS), Kittery, Maine, was prepared by Tetra Tech NUS, Inc. (Tetra Tech) for the United States Department of the Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic under the Comprehensive Long-Term Environmental Action Navy (CLEAN) Program, Contract Number N62470-08-D-1001, Contract Task Order (CTO) WE26. This RI Report was prepared to fulfill the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and is consistent with the United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (October 1988) and the Navy Environmental Restoration Program (NERP) Manual, Chapter 8, Remedial Investigation/Feasibility Study (August 2006).

1.1 PURPOSE AND SCOPE OF REPORT

The purpose and scope of the RI Report for OU9 is to characterize the nature and extent of contamination and to evaluate potential risks to human receptors at Site 34 – Former Oil Gasification Plant (Building 62), the only site within OU9. OU9 is in an area that is currently and has historically been an industrial area with no onshore ecological habitats; therefore, potential onshore ecological risks were not evaluated. Current and future potential for offshore migration of contaminants at the site was evaluated as part of this RI Report. Offshore impacts from past releases are being addressed under OU4 and are outside the scope of this report. These past releases were from erosion and overland migration of OU9 contaminants to the offshore area defined as Interim Offshore Monitoring Program Monitoring Station-01 (MS-01).

This RI Report is a culmination of the evaluation of data collected under various investigations before and after a non-time critical removal action in 2007. The purpose of the removal action was to abate potential exposure to nearby human populations and to mitigate the potential threat of a release to the environment of hazardous substances form the ash observed at OU9 prior to conducting an RI to address potential residual risks (Navy, February 2006). The investigations included sampling of surface and subsurface soil at OU9. For the RI Report, sampling conducted before the removal action was only used to support the understanding of past contaminant sources and geological and hydrogeological conditions pre-2007. Post-removal action sampling was used to understand geological conditions, the nature and extent of contamination, and potential site risks. Groundwater was not sampled as part of any investigation because no overburden groundwater is present at OU9. Groundwater in bedrock was not investigated because site contamination is present in soils located above bedrock and these contaminants are considered immobile, as detailed in Section 5.1.

1.2 REPORT ORGANIZATION

This report has been organized into the following seven sections:

- Section 1.0 – Introduction: This section provides a description of the purpose and scope of the RI Report; the facility, site descriptions, and history; and summaries of previous environmental investigations and removal actions.

- Section 2.0 – Study Area Investigation: This section describes RI sampling activities and data usability.

- Section 3.0 – Site Characterization: This section describes OU9 demography, surface features, soils, geology, hydrogeology, surface water use, hydrogeology, ecology, and climatology.

- Section 4.0 – Nature and Extent of Contamination: This section discusses the types, magnitudes, and spatial distribution of contaminants present in soil at OU9 after the 2007 removal action.

- Section 5.0 – Contaminant Fate and Transport: This section discusses the properties of the chemicals detected at OU9 and their potential persistence, migration, and dispersion or degradation pathways. This section also discusses the Conceptual Site Model (CSM) and contaminant migration.

- Section 6.0 – Human Health Risk Assessment: This section presents the Human Health Risk Assessment (HHRA) for OU9.

- Section 7.0 – Conclusions and Recommendations: This section presents a summary of the nature and extent of contamination, contaminant fate and transport, and risk assessment and also provides the conclusions and recommendations of the RI.

Appendix A contains a summary table of OU9 boring data, figures displaying contaminant concentrations and site conditions from the 2007 removal action, boring logs, sample collection logs for OU9, and calculations that present how the percentage of ash remaining on-site was estimated. Appendix B contains the results of the background analysis conducted for this RI. Appendix C contains details supporting the HHRA and example calculations. Appendix D contains analytical results, including the complete database printout for soil. Appendix E contains the responses to comments on the draft RI Report.

1.3 FACILITY AND OU9 DESCRIPTION AND HISTORY

This section provides descriptions and history for PNS and OU9.

1.3.1 Facility Description and History

PNS is a military facility with restricted access on an island located in the Piscataqua River, as shown on Figure 1-1. PNS is referred to on National Oceanic and Atmospheric Administration (NOAA) nautical charts as Seavey Island, with the eastern tip given the name Jamaica Island. Clark's Island is to the east, attached by a rock causeway to Seavey Island. The Piscataqua River is a tidal estuary that forms the southern boundary between Maine and New Hampshire. PNS is located in Kittery, Maine, north of Portsmouth, New Hampshire, at the mouth of the Great Bay Estuary (commonly referred to as Portsmouth Harbor).

PNS is engaged in the conversion, overhaul, and repair of submarines for the Navy. The long history of shipbuilding in Portsmouth Harbor dates back to 1690, when the first warship launched in North America, the Falkland, was built. The first government-built submarine was designed and constructed at PNS during World War I. A large number of submarines have been designed, constructed, and repaired at this facility since 1917. PNS continues to service submarines as its primary military focus.

Prior to CERCLA and Resource Conservation and Recovery Act (RCRA) regulation at PNS, years of shipbuilding and submarine repair work resulted in hazardous substances being released into soil, groundwater, surface water, and sediment on and around Seavey Island. As a result, investigation and remediation activities were performed under the Department of Defense (DoD) Installation Restoration Program (IRP). Paralleling CERCLA, the IRP focuses on the cleanup of contamination from past hazardous waste operations and past hazardous material spills and is further discussed in the Site Management Plan (SMP) for PNS [Amended Fiscal Year (FY)12], (Navy, June 2011).

Investigations of hazardous substance releases at PNS began in 1983 with the Initial Assessment Study (IAS) (Weston, June 1983). USEPA became involved with PNS in 1985 when the agency requested information on PNS' hazardous wastes and conducted a visual site inspection under the authority of RCRA. Since 1988, the Maine Department of Environmental Protection (MEDEP) has also provided oversight of investigation and remediation activities at PNS. In March 1989, USEPA issued a Corrective Action Permit under the RCRA Hazardous and Solid Waste Amendments (HSWA) of 1984 (March 1989) that required PNS to investigate 13 Solid Waste Management Units (SWMUs) and take appropriate corrective action. Until the mid-1990s, investigations at PNS were conducted under RCRA authority. Effective May 31, 1994, PNS was included on the National Priorities List (NPL), and subsequent studies have been conducted under the authority of CERCLA, commonly known as Superfund. Consistent with

the transition from RCRA to CERCLA, the SWMUs were renamed as "sites." Ongoing studies to develop and evaluate remedial activities are conducted as part of Feasibility Studies (FSs) (CERCLA terminology) and combine both RCRA and CERCLA criteria.

The Federal Facility Agreement (FFA) for PNS was signed by USEPA and the Navy in September 1999, became effective February 2000, and supersedes the HSWA Permit. The State of Maine has elected not to be a party to the FFA at this time; however, the state is afforded a participatory role in the site remediation process in accordance with CERCLA. Among other things, the FFA outlines roles and responsibilities, establishes deadlines/schedules, outlines work to be performed, and provides a dispute resolution process for primary documents. The FFA ensures that CERCLA decisions will be consistent with RCRA and other federal and state hazardous waste statutes and regulations, as appropriate for the sites at PNS.

1.3.2 OU9 Description and History

OU9 consists of Site 34 – Former Oil Gasification Plant (Building 62), which is located in the northwestern portion of PNS, east of a bridge from the mainland to PNS (at Gate 1). Figure 1-1 shows the location of OU9 at PNS, and Figure 1-2 shows the layout of OU9.

The majority of OU9 is relatively flat, with a gentle slope from the south of the site toward the north of Building 62 and a steep slope to the water's edge at the shoreline of the Piscataqua River Back Channel. Building 62 and Building 62 Annex are used by PNS Public Works for temporary storage of non-hazardous materials. The buildings around the site include a Shipyard work shop (Building 60) and temporary storage spaces for non-hazardous materials (Buildings 40 and 43). As shown on Figure 1-2, areas west and south of Building 62 are paved, and areas north and east of Building 62 are covered with grass or other vegetation and are considered open-green areas. Riprap covers the slope north of Building 62.

OU9 is in the PNS Historic District that was listed on the National Register of Historic Places in 1977. Buildings 40, 43, 60, and 62, which are within or near OU9, have been identified as contributing elements to the National Register Eligible District (Louis Berger Group, April 2003). Therefore, these buildings are considered to be of historical significance, and the Shipyard is required to coordinate any modifications to the structures with the State Historic Preservation Officer.

OU9 is the location of a former oil gasification plant. Building 62 (built in the late 1800s) and Building 62 Annex (built in the 1940s) are the most prominent features related to the use of OU9. Site history is detailed in the Site 34 Site Investigation Quality Assurance Project Plan (QAPP) (Tetra Tech, March

2003) and the Engineering Evaluation/Cost Analysis (EE/CA) for Site 34 (Tetra Tech, September 2005) and is summarized as follows:

- 1870s to early 1900s: Coal was used to provide heat for gasification operations that converted kerosene to illuminating gas. The gasification operations took place in Building 62, and gas was piped to other areas of PNS to be used in lamps.

- 1901 to 1912: The gasification plant in Building 62 was closed, all the machinery was removed, and a concrete floor was reportedly laid in the building.

- 1915 to 1930: The Shipyard Public Works Department used Building 62 as a blacksmith shop, during which time (in 1919) the building was reportedly gutted by a fire.

- 1930 to 1985: The Shipyard Public Works Department used Building 62 for storage activities, including storage of pesticides, insecticides, and/or herbicides. A steam line on the exterior of the building, at the wash pad, was reportedly used for flushing equipment and washing coveralls used during pesticide shop activities. Pesticide storage activities at Building 62 began in the 1960s and ended when a new pesticide control shop was built on the southern side of the Shipyard in 1985.

- 1940s: Building 62 Annex was built and used for temporary storage of non-hazardous materials.

- 1985 to present: The Shipyard Public Works Department continues to use the Building 62 and Building 62 Annex for temporary storage of non-hazardous materials.

Based on these historical site uses, coal combustion was the major source of OU9 contamination. Tar generation during the oil gasification process and pesticide operations in Building 62 were also identified as potential sources of OU9 contamination. These sources are further described in Section 1.5.

1.4 SUMMARY OF ENVIRONMENTAL REPORTS AND ACTIONS AT OU9

Site 34 was identified as a potential PNS IRP site when ash was observed on the northern side of Building 62 in 1998. The Navy collected soil and sediment samples in 1998 to support prioritization of investigation of the site under the IRP. One soil sample from the ash, one soil sample near the ash, and two sediment samples in the intertidal offshore area were collected and analyzed. A limited excavation of ash from the former ash pile was conducted in 1999. The excavation was terminated when the volume of ash encountered exceeded the estimated two 55-gallon drums (FWENC, April 1999). Subsequently a Site Screening Investigation (SSI) was conducted.

The SSI was conducted in 2003 to determine whether an RI or other action was necessary for the site. The SSI also included collection of data to support a non-time critical removal action for ash. The SSI involved soil (including ash material) and sediment sampling. During the 2003 investigation, temporary monitoring wells were installed in several borings. Groundwater was not present in overburden soil; therefore, groundwater samples were not collected. The temporary monitoring wells were subsequently abandoned. Chemical fractions analyzed in soil and ash included Target Compound List (TCL) volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals, cyanide, and dioxin/furans. Sediment samples collected from the wash pad catch basin and near the storm water outfall (OF-49) were analyzed for pesticides.

The results of the SSI are provided in the SSI Report for Site 34 (Tetra Tech, August 2004). A risk screening evaluation conducted as part of the SSI indicated that polycyclic aromatic hydrocarbons (PAHs) and metals (antimony, lead, and mercury) were detected at concentrations greatly exceeding industrial and residential risk screening levels. Concentrations of VOCs, SVOCs other than PAHs, pesticides, PCBs, dioxin/furans, cyanide, and metals other than antimony, lead, and mercury did not exceed risk screening levels or PNS facility background levels. The SSI Report concluded that PAHs and select metals were the contaminants associated with ash at OU9, and that by removing the ash, the majority of site risks would be addressed. The SSI Report also indicated that source contamination had not migrated from the ash to underlying soil and that pesticide concentrations on site were low in relation to risk screening and facility background levels. Therefore, site-related pesticide storage and rinsing activities had not resulted in a CERCLA release to soil at the site. The SSI Report recommended that a RI be performed after the removal action to address the potential residual risks from site operations. Additional investigation to delineate the extent of ash to support the removal action was also recommended.

An ash extent investigation was performed in April 2004. The visual presence of ash was used to determine the approximate extent of the ash to support a non-time-critical removal action. Based on the ash extent investigation, the composition of the ash material was described as a “burnt zone” composed of several key components: black, crumbly, fine- to coarse-grained sand; up to ¼-inch (occasionally larger) clinkers (burnt coal); kidney-shaped black pieces of coke up to ½ inch in length; gray to off-white ash intermixed with sand and gravel; and small reddish-brown, non-metallic spheres/nodules generally less than ⅛ inch in diameter. Gray to off-white ash was only observed inside the ash pile. The burnt material outside the ash pile was mostly fine- to coarse-grained sands and clinkers. The results of the investigation were documented in the EE/CA (Tetra Tech, September 2005) conducted to develop and evaluate non-time-critical removal action alternatives to reduce potential risks to human health from

exposure to ash and to reduce potential future erosion of ash at OU9. The extent and thickness of ash based on the investigation is shown on Figure 1-3. The recommended alternative was removal of the majority of ash from the site.

The removal action was conducted in 2007 and included removal of ash on the northern and southern side of the site, and stabilization of a portion of the shoreline. The majority of ash was excavated and the area backfilled with fill material from an off base borrow source (Shaw, July 2008). Figure 1-3 indicates the portion of the site not excavated. The remainder of the area within the 2007 excavation limit on Figure 1-3 was excavated. As part of the removal action, ash and soil mixed with ash were removed by excavating from the surface until native material with no ash was observed. Native and non-native materials were identified based on their color. Before backfilling, photographs of the excavation area were taken. Backfilling was conducted after Shipyard Environmental Office personnel provided approval that all ash was removed. Most areas were excavated to 2 to 4 feet below ground surface (bgs); the ash pile area was excavated to 6 to 7 feet bgs. Outside the ash pile, most of the excavated material consisted of coal and charcoal pieces mixed with soil. Ash and soil were excavated along the top of the shoreline north of Building 62 and Building 62 Annex, the area was regraded with a gentler slope, and shoreline controls were placed over the area (see Figure 1-2). Based on discussion between the Navy and regulators, soil was not removed from directly under a portion of the storm sewer line to Outfall 50 (see Figure 1-3) to avoid damage to the line. In addition, the grassy area with large trees northeast of Building 62 was not excavated so that the trees would not be harmed. Based on the ash extent investigation (Tetra Tech, September 2005), ash was generally found in the top 0.5 to 2 feet of soil in relatively thin layers in the grassy area. Also, as the adjacent shoreline (bedrock ledge) to the grassy area is stable, erosion of ash along the shoreline in that area was not considered likely. Therefore, the Navy determined that excavation of the ash in the grassy area was not warranted as part of the removal action. The removal action activities are documented in the Site 34 Removal Action Report (Shaw, July 2008).

1.5 POTENTIAL SOURCES OF CONTAMINATION AT OU9

Based on these historical site uses and environmental investigations at OU9, the following describes the potential sources of contamination.

Coal (fuel) combustion during the oil gasification process and during blacksmithing activities led to the generation of ash. Ash mixed with clinkers (metallic impurities from burnt coal), assumed to be from the combustion of coal (and potentially including ash from the 1919 building fire), was piled primarily north of Building 62. During initial environmental investigations, the ash pile was found to cover an area approximately 100 feet long (along the length of Building 62 and Building 62 Annex) and 30 feet wide that extended northward to the edge of a former road (removed in 2007) that ran east-west and parallel to the

northern edges of the buildings. The ash pile was covered by a layer of soil and vegetation. Ash was also found under asphalted areas around Buildings 62, 62 Annex, 63, and under the Building 63 foundation. The majority of ash was removed in 2007. Ash remains in unexcavated areas of OU9 and possibly under Building 62 Annex. As discussed in Section 2.0, ash was not found under Building 62 during RI sampling.

Information on tar generation in Building 62 is provided in the Industrial History of Building 62 (PNS, October 1996). The report indicates that tar was generated as a by-product of the oil gasification process. The specific process used at this plant was reportedly very efficient and produced very small volumes of tar residue; however, records of actual volumes are not available. Based on a historical drawing in the report, a tar pit used to store tar generated from the oil gasification process existed inside Building 62 when the plant was in operation. The tar pit is shown to have had an opening approximately 5-feet by 5-feet in size on historical figures. Tar may have been removed from the pit when the oil gasification process was terminated and all associated equipment was removed from the building. A concrete floor was placed after oil gasification processes ceased and that floor covers the opening to the tar pit. Currently, a restroom is located above the former tar pit location (PNS, October 1996). General information on tar from oil gas manufacturing plants shows that elementally, the tar is primarily carbon (89 to 94 percent) and hydrogen (4 to 7 percent). PAHs are the major USEPA priority pollutant associated with tar. Phenanthrene, fluoranthene, and pyrene are the dominant PAHs found in oil tar (Hong and Luthy, 2007). As discussed in Section 2.0, tar was not found under Building 62 during RI sampling.

As indicated in Section 1.4, past pesticide storage was not a source of contamination at OU9 and pesticides are not site-related contaminants.

Based on the environmental investigations discussed in Section 1.4, PAHs, antimony, lead, and mercury were determined to be the contaminants associated with OU9 past sources.

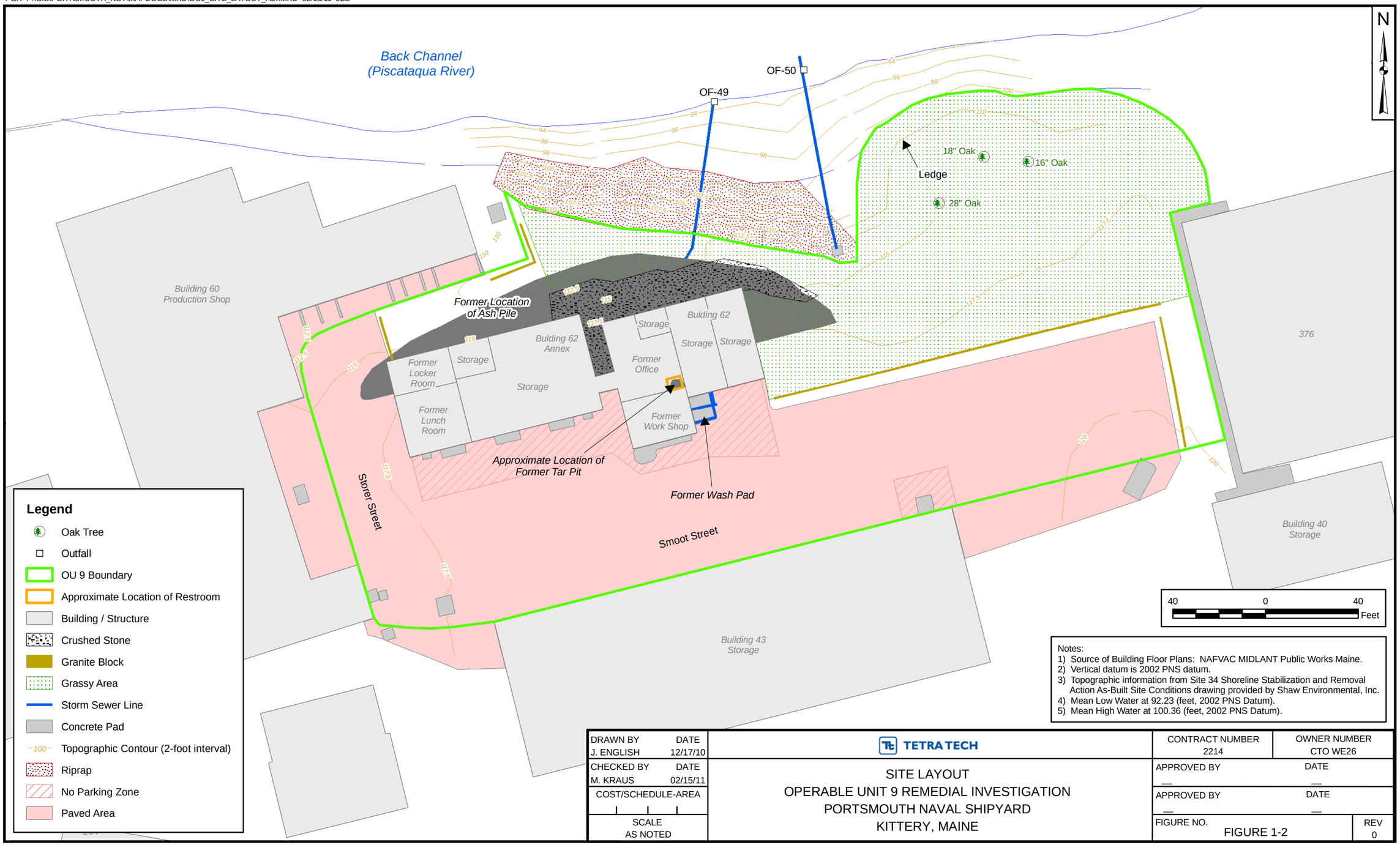
P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\OU9_VICINITY_ALT.MXD 02/10/11 JEE

Aerial Photo Source: Imagery downloaded from the NAVFAC Mid-Atlantic GeoRepository. Imagery shows existing conditions at the shipyard from May 2008, while the surrounding area is shown from 2003.

500 0 500 Feet

DRAWN BY T. WHEATON	DATE 12/28/09	TETRA TECH	CONTRACT NUMBER 2214	OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/10/11	LOCATION MAP OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY —	DATE —
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 1-1	REV 0

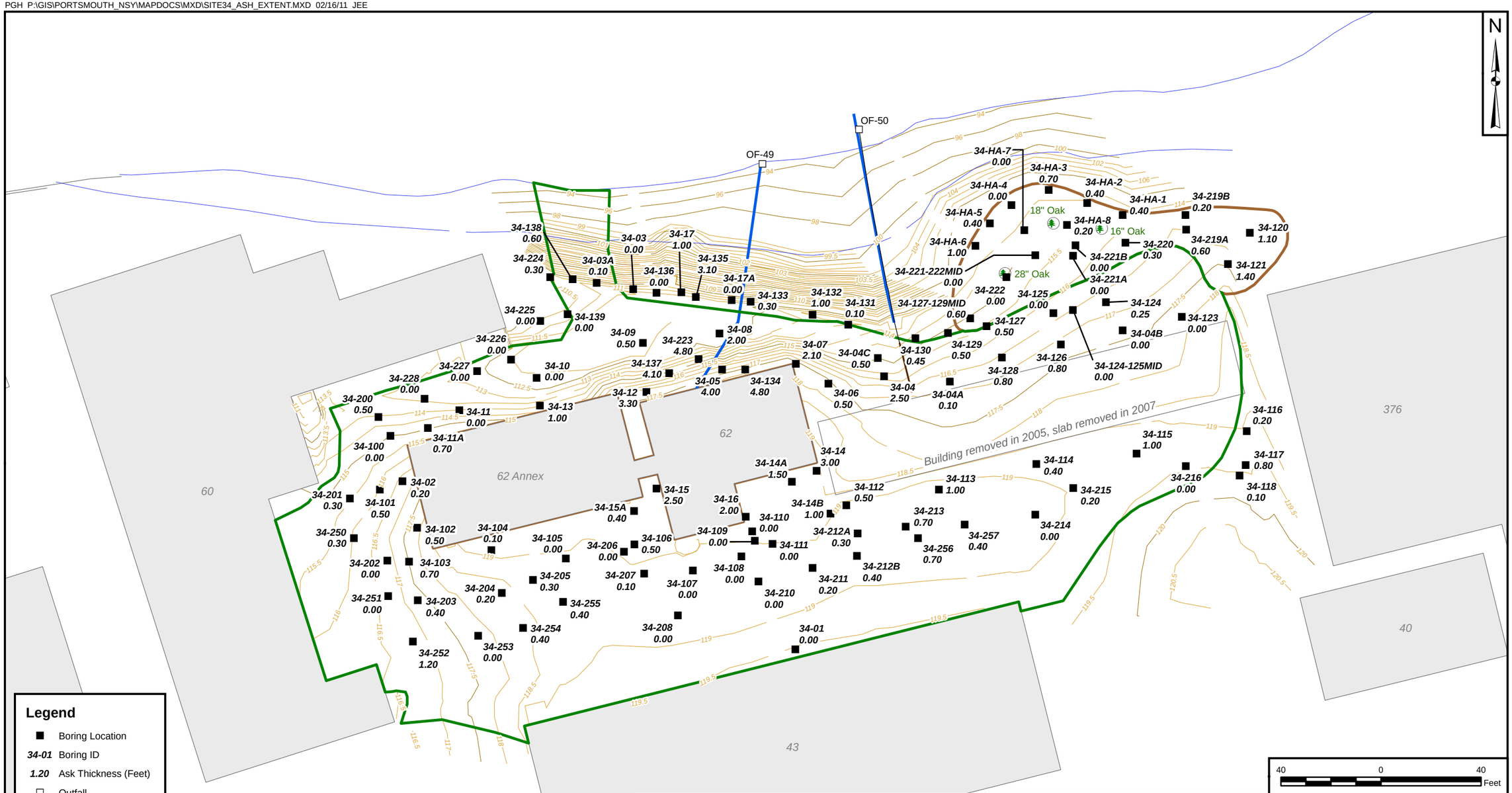
PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\OU9_SITE_LAYOUT_ALT.MXD 02/15/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).

DRAWN BY J. ENGLISH	DATE 12/17/10	TETRA TECH	CONTRACT NUMBER 2214	OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/15/11	SITE LAYOUT OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY —	DATE —
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 1-2	REV 0

PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_ASH_EXTENT.MXD 02/16/11 JEE



Legend

- Boring Location
- 34-01 Boring ID
- 1.20 Ask Thickness (Feet)
- Outfall
- Oak Tree
- 2007 Excavation Limit
- Unexcavated Area
- Building / Structure
- Storm Sewer Line

Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).

DRAWN BY	DATE
J. ENGLISH	02/10/11
CHECKED BY	DATE
M. KRAUS	02/15/11
REVISED BY	DATE
—	—
SCALE	
AS NOTED	

TETRA TECH

PRE-REMOVAL ACTION ASH THICKNESS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

CONTRACT NUMBER	CTO NUMBER
2214	WE26
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
FIGURE NO.	REV
FIGURE 1-3	0

2.0 STUDY AREA INVESTIGATION

This section provides information on RI sampling activities and an assessment of data included in the RI that was conducted based on the OU9 RI Sampling and Analysis Plan (SAP) (Tetra Tech, July 2009).

2.1 REMEDIAL INVESTIGATION

The RI was conducted to define the nature and extent of contamination and to support the risk assessment using data collected after the 2007 removal action. Data from the RI were also used to determine whether remedial action is needed to address ash or tar suspected to be present under Building 62. To satisfy the RI objectives, several borings were drilled below Building 62, and soil samples were collected from areas where ash was previously excavated and from unexcavated areas of the site (see Figure 2-1). Soil sample locations and depths were selected to provide data for the fill soil and native soil and to support the HHRA. In accordance with the OU9 RI SAP, samples were sent to a fixed-base laboratory for analysis of PAHs, antimony, lead, and mercury. Sediment samples collected as part of the RI in the offshore area of OU9 are being used to support OU4 and are not discussed any further in this report.

Soil borings were advanced beneath Building 62 and soil samples were collected in August 2009 (Tetra Tech, January 2010). The data were evaluated to determine whether performance criteria specified in the SAP were met. Sample results indicated that fill and underlying soil in the excavated area had chemical concentrations and variability greater than expected; whereas soil in the unexcavated area had chemical concentrations and variability less than expected. Although no ash or tar was encountered in soil borings from beneath Building 62, an unexpected pocket of ash and coal was discovered in the excavated area north of Building 62, between the building and the riprap on the ledge to the river. Based on the evaluation of the August 2009 field investigation, the Navy determined that additional data were needed for the RI to adequately characterize contaminant distribution and corresponding site risks at OU9. Therefore, a field task modification for the OU9 RI SAP was prepared (in July 2010), and additional soil samples were collected in September 2010 (Tetra Tech, January 2011). The additional data were used with the 2009 data to evaluate the nature and extent of contamination and human health risk in this RI Report. A summary of the sampling and analytical program during the RI is provided in Table 2-1, and sampling locations are shown on Figure 2-1.

2.2 DATA USABILITY

Data for OU9 were generated during various investigations before and after the 2007 removal action. Analytical data from investigations before the removal action (e.g., SSI) are not representative of current

site conditions and were not used to support the evaluation of the nature and extent of contamination or human health risk in this RI Report. However, the data were used as part of the OU9 RI SAP to determine the chemicals associated with site releases and to develop the RI analytical program (Tetra Tech, July 2009). Information from pre-excavation borings (SSI and Ash Extent Investigation) was used to support the understanding of geological conditions outside and beneath the excavated area, as discussed in Section 3.0.

The usability of the data for the RI Report is discussed further herein. The analytical data used in the RI are from the 2009 and 2010 RI sampling events. All data are considered useable for evaluating the nature and extent of contamination and site risks. The following discussion of data usability identifies data considerations and limitations for the data used in this RI Report. Samples collected during the RI were analyzed by fixed-base laboratories and validated in accordance with the project objectives provided in the OU9 RI SAP.

Data Quality Reviews (DQRs) for the 2009 and 2010 RI sampling events are presented in Appendix D of the OU9 RI Data Package (Tetra Tech, January 2010) and the OU9 RI Supplemental Data Package (Tetra Tech, January 2011), respectively. Overall, no significant deficiencies or concerns pertaining to the representativeness of the data compared to site conditions were raised in the DQRs, and the data were deemed suitable for use in the OU9 RI.

For the 2009 RI sampling event, it was determined that the data collected were generally representative of site conditions. No major data usability issues were identified in the DQR for the 2009 RI sampling event, and all data are considered useable for the purposes of the OU9 RI as defined in the OU9 RI SAP. However, an unexpected lead concentration was detected in the 2007 backfill material, PAH concentrations in the backfill material were greater than expected, and unexpected small erratic pockets of ash were discovered in the excavated area. These unexpected results were not in agreement with the CSM in the OU9 RI SAP; therefore, it was decided that additional samples would be collected to better characterize the excavated area of the site.

For the 2010 RI sampling event, it was determined that data were representative of site conditions. No major data usability issues were identified in the DQR for the 2010 RI sampling event, and all data were considered useable for the purposes of the OU9 RI as defined in the OU9 RI SAP. No further elevated concentrations of lead were detected in the 2007 backfill material or in any other site soils. The unexpected high concentration of lead detected in one sample of the 2007 backfill material during the 2009 RI sampling event appears to have been an anomaly and is not representative of site conditions. Concentrations of PAHs in backfill material were similar to concentrations detected during the 2009 RI

sampling event. The pockets of ash in the excavated area were verified to be small and isolated (see Section 3.0).

Minor data usability considerations identified in the DQRs for the 2009 and 2010 RI sampling events further considered in this RI Report are:

- Boring OU9-22 could not be installed at its intended location. Location OU9-22, which was the proposed sample location north of sampling location OU9-13, was placed to determine whether ash was still present under fill material in this area. A 12-inch water line is located in the targeted area, and the sample was moved south, in the vicinity of OU9-13; therefore, it could not be determined whether residual ash remains between the area north of the subsurface ash pocket found near OU9-13 and riprap.

- All but nine of the antimony soil results were qualified due to matrix spike percent recoveries less than the corresponding quality control limit. Despite the poor antimony recoveries in those samples, qualified results were not rejected and are considered usable for the purposes of the RI. Estimated soil antimony risks may be biased low by approximately 70 percent as indicated by low matrix spike recoveries detected during data validation. However, the antimony soil concentrations detected were low compared to the USEPA residential risk screening level (RSL) for antimony of 31 milligram per kilogram (mg/kg). The maximum concentration of antimony detected at OU9 was 2.3 mg/kg. Increasing that concentration by 70 percent results in a concentration of 3.9 mg/kg which is still an order of magnitude less than the USEPA residential soil RSL for antimony. Even though matrix spike quality control (QC) samples indicated that antimony results were biased low; the site soil concentrations of antimony were low enough that antimony does not present unacceptable site risks.

TABLE 2-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Location	Sample ID	Sample Depth (feet bgs)	Analyses
OU9-SB01	OU9-SS-01-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-01-0204	2 to 4	
OU9-SB02	OU9-SS-02-0002	0 to 2	Antimony, Lead, Mercury, PAHs
OU9-SB03	OU9-SS-03-0002	0 to 2	Antimony, Lead, Mercury, PAHs
OU9-SB04	OU9-SS-04-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-04-0205	2 to 5	
	OU9-SB-04-0508	5 to 8	
	OU9-SB-04-0508-D		
OU9-SB05	OU9-SS-05-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-05-0205	2 to 5	
	OU9-SB-05-0507	5 to 7	
OU9-SB06	OU9-SS-06-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-06-0205	2 to 5	
	OU9-SB-06-0508	5 to 8	
OU9-SB07	NS	NA	NA
OU9-SB08	NS	NA	NA
OU9-SB09	NS	NA	NA
OU9-SB10	OU9-SS-10-0002	0.5 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-10-0608	6 to 8	

TABLE 2-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Location	Sample ID	Sample Depth (feet bgs)	Analyses
OU9-SB11	OU9-SS-11-0002	0.5 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-11-0206	2 to 6	
	OU9-SB-11-0206-D		
OU9-SB12	OU9-SS-12-0002	0.5 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SS-12-0002-D		
	OU9-SB-12-0204	2 to 4.5	
	OU9-SB-12-0406	4.5 to 6	
	OU9-SB-12-0608	6 to 8	
OU9-SB13	OU9-SB-13-0406	4 to 6	Antimony, Lead, Mercury, PAHs
	OU9-SB-13-0608	6 to 8	
OU9-SB14	OU9-SB-14-0406	4 to 6	Antimony, Lead, Mercury, PAHs
	OU9-SB-14-0608	6 to 8	
	OU9-SB-14-0810	8 to 10	
OU9-SB15	OU9-SB-15-0406	4 to 6	Antimony, Lead, Mercury, PAHs
	OU9-SB-15-0608	6 to 8	
	OU9-SB-15-0810	8 to 10	

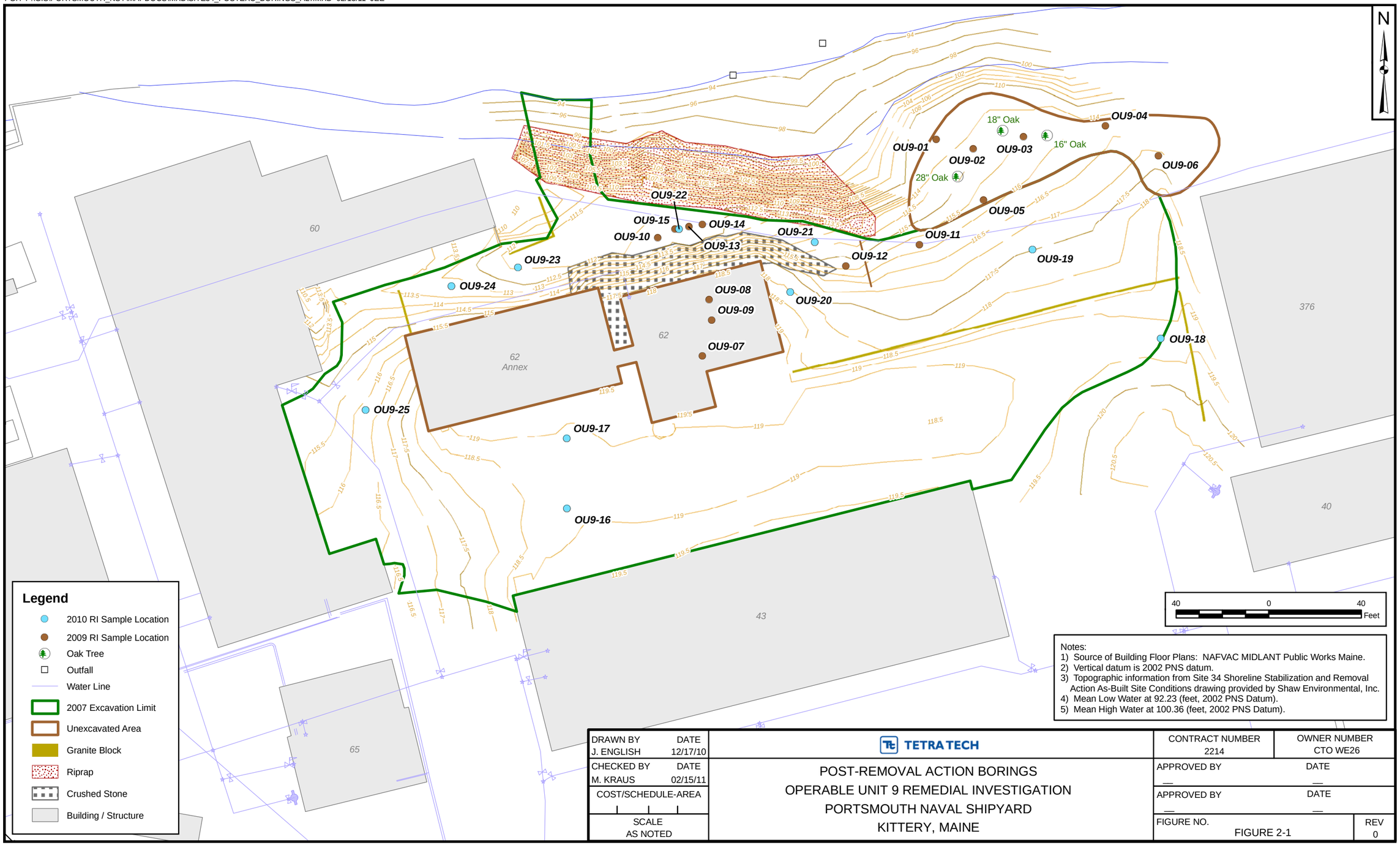
TABLE 2-1

SUMMARY OF SAMPLING AND ANALYTICAL PROGRAM
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Location	Sample ID	Sample Depth (feet bgs)	Analyses
OU9-16	OU9-SS-16-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-16-0205	2 to 5	
	OU9-SB-16-0508	5 to 8	
OU9-17	OU9-SS-17-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-17-0205	2 to 5	
	OU9-SB-17-0205-D		
	OU9-SB-17-0508	5 to 8	
OU9-18	OU9-SS-18-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-18-0205	2 to 5	
	OU9-SB-18-0508	5 to 8	
	OU9-SB-18-0508-D		
OU9-19	OU9-SS-19-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-19-0205	2 to 5	
	OU9-SB-19-0508	5 to 8	
OU9-20	OU9-SS-20-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-20-0205	2 to 5	
	OU9-SB-20-0508	5 to 8	
OU9-21	OU9-SS-21-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-21-0205	2 to 5	
	OU9-SB-21-0508	5 to 8	
OU9-22	OU9-SS-22-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SS-22-0002-D		
	OU9-SB-22-0205	2 to 5	
	OU9-SB-22-0508	5 to 8	
OU9-23	OU9-SS-23-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-23-0204	2 to 4	
	OU9-SB-23-0508	NS	NA
OU9-24	OU9-SS-24-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-24-0204	2 to 4.5	
	OU9-SB-24-0508	NS	NA
OU9-25	OU9-SS-25-0002	0 to 2	Antimony, Lead, Mercury, PAHs
	OU9-SB-25-0205	2 to 5	
	OU9-SB-25-0508	5 to 8	

bgs - Below ground surface
EOB - End of boring
NA - Not applicable
NS - No sample collected as per OU9 RI SAP (Tetra Tech, July 2009)
PAH - Polycyclic aromatic hydrocarbon

PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_POSTEXC_BORINGS_ALT.MXD 02/15/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).

DRAWN BY J. ENGLISH	DATE 12/17/10	TETRA TECH	CONTRACT NUMBER 2214 / OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/15/11	POST-REMOVAL ACTION BORINGS OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 2-1 / REV 0

3.0 SITE CHARACTERIZATION

This section provides information on the demography, land use, surface features, soils, geology, hydrogeology, surface water and hydrology, ecology, and climatology at PNS and OU9. Information on site characterization is used to support the evaluation of the nature and extent of contamination, development of the CSM, and understanding of potential site risks.

Elevations discussed herein and throughout the RI are based on the 2002 PNS Vertical Datum and Control Network. The 2002 PNS Vertical Datum equates Mean High Water (MHW) (which is 3.58 feet in the North American Vertical Datum of 1988 or NAVD 88) to 100.36 feet. Horizontal locations are based on the North American Datum (NAD) of 1983, Maine State Plane Coordinate System, West Zone. Figure 3-1 shows the area that supports the Section 3.0 discussion.

3.1 DEMOGRAPHY AND LAND USE

PNS is located in Kittery, York County, Maine, and is an island south of Kittery, Maine, and east of Portsmouth, New Hampshire. Portsmouth, located in Rockingham County in southeastern New Hampshire, is equidistant from Portland, Maine, to the north and Boston, Massachusetts, to the south. PNS is situated in the Piscataqua River, approximately 200 feet from Kittery, Maine, and approximately 800 feet from Portsmouth, New Hampshire. PNS is connected to Kittery via two bridges on the northern side of the facility. PNS has approximately 80 officers and enlisted personnel and about 4,400 civilian employees (PNS, February 2011). Kittery, Maine, is a residential community of 9,500 people, and Portsmouth, New Hampshire, has a population of approximately 21,000 (based on the 2000 Census). Area industries include retail and wholesale trades, textiles, manufacturing, fishing, shipbuilding, power plants, and gas storage facilities. The countryside north and west of Kittery consists of forests and some farmland. Along the coast south of Portsmouth are small communities and seasonal dwellings.

Portsmouth is a part of the northeastern market area that serves about one-third of the nation's population in addition to eastern Canada. Major economic sectors in Portsmouth include tourism, retail and service industries, and fishing and agriculture. One of the area's major employers is PNS. The Port of Portsmouth is a center for exporters and importers of road salt, scrap metal, fuel oil, building materials, and other goods; many exporters are located in Portsmouth. Overall, more than 5 million tons of cargo per year make the short journey between the Atlantic Ocean and the port's dock (Answers.com, June 2008).

Various vessels operate in Portsmouth Harbor including commercial tankers, cargo ships, fishing trawlers, lobster boats, recreational vessels, and submarines located at PNS. Commercial and recreational fishing

occur in the harbor, including in the vicinity of PNS. Parts of the Portsmouth Harbor shoreline are heavily developed, and PNS, commercial docks, and marinas dominate the landscape. Numerous parks and historical areas are also located nearby.

The Navy currently conducts maintenance of submarines at PNS. This activity is conducted mainly in the western portion of the facility in the Controlled Industrial Area (CIA) (the southern and southwestern portions of Dennett's Island, southwest of OU9), which includes all of the dry docks and submarine berths and numerous buildings that house trade shops related to maintenance activities. Access to the CIA is tightly controlled and limited to individuals having appropriate clearances. Uses of other portions of PNS include administration offices, officers' residences, equipment storage, parking, and recreational facilities. However, only military operations (related to submarines) occur within the CIA, and no non-military residential or recreational facilities exist within the CIA. The current land use for Building 62 and Building 62 Annex is temporary storage of non-hazardous materials by PNS Public Works. The OU9 area has been industrial and occupational since the 1870s when oil gasification activities began.

A portion of PNS is on the National Register of Historic Places. The area between the two bridges connecting PNS to Kittery, Maine, was placed on the Register by the National Park Service in 1977. A Cultural Resources Survey of PNS was conducted in the early 2000s by Louis Berger Group, Inc. Based on the survey, the boundary of the PNS Historic District was expanded and includes the majority of the CIA. Two other historic districts were also identified in the survey (Portsmouth Naval Hospital and Portsmouth Naval Prison Historic Districts). OU9 is located within the area placed on the Register by the National Park Service and is described as an area with moderate historical archaeological resource sensitivity. Based on review of the Cultural Resources Survey for PNS (Louis Berger Group, April 2003), Building 62 was determined to be a contributing element to the National Register District, therefore any work to be performed near or within these buildings that would affect the structures must comply with Section 106 of the National Historic Preservation Act. In consideration of those requirements, during the 2004 Ash Extent Investigation, subsurface soil borings were inspected by an archaeologist for cultural artifacts. No cultural artifacts were found at any of the subsurface boring locations. The inspection concluded that it was unlikely that the removal of ash deposits from the areas around Building 62, Building 62 Annex, or Building 63 would affect historic properties, although it was recommended that additional direct-push (mechanical) methods be used to obtain better data on the presence or absence of cultural artifacts, or that archaeological monitoring be conducted if excavation were to occur in the area north of Building 63, where a grass-covered picnic area currently exists (i.e., in the unexcavated area).

3.2 SURFACE FEATURES

PNS is built on an area comprising Dennett's, Seavey, Jamaica, and Clark's Islands and man-made land between these islands. The total area of PNS is about 278 acres, approximately 90 acres of which is

filled land. Approximate elevations at PNS range from a maximum of 160 feet at the interiors of the historical islands to 100 feet along the perimeter of the facility. Two-thirds of the facility is a high-density industrial area containing over 300 buildings, and the remaining areas are flat-lying to gently sloping grass-covered fields. Housing for military personnel is located in various areas of the Shipyard. Minor wooded areas exist on the eastern side of Jamaica Island, and two freshwater ponds are located in the central portion of the facility.

At OU9, elevations are highest to the south of Building 62 and Building 62 Annex along Smoot Street (117 to 120 feet). North of Building 62, the ground begins to slope steeply down toward the Back Channel. OU9 is relatively flat with an average elevation of 118 feet. The lowest elevations are along the shoreline (Figure 3-1).

OU9 is a commercial area covered with pavement and other buildings in areas east, south, and west of Building 62 and Building 62 Annex and covered with grass north and east of Building 62, with some trees and shrubs in the far northeastern portion. To the north of Building 62, the shoreline is steeply sloping with riprap covering the upper portion of the slope (described in Section 3.1). A bedrock outcrop forms the shoreline north of former Building 63. Surface water runoff is collected by storm drains that discharge to storm water outfalls along the shoreline (Figure 3-1).

3.2.1 Shoreline Protection

During the 2007 Soil Removal Action, a portion of the shoreline was stabilized and reinforced by removing existing overburden and overhangs from the slope surface, and shoreline protection, with the approximate dimensions of 150 feet by 40 feet, using a 6-ounce geotextile separation layer and heavy riprap (stones with a minimum weight of 500 pounds and approximately 50 percent of stones less than 1,000 pounds) was installed. The heavy riprap was visually selected and inspected by contractor field personnel (Shaw, July 2008). A bedding layer of stones 3- to 5-inch-diameter stones was placed over the geotextile separation layer on flat and moderately sloped portions of the site. Geotextile panels were overlapped by 2 feet instead of seaming or sewing the panels together. The finished slope of the shoreline was 1:1 or less, as shown on as-built drawings and Figure 3-3. As-built drawings for the shoreline stabilization are presented in Appendix A.

3.3 SOILS

Natural material overlying bedrock on the original islands consists primarily of glacial till that ranges in thickness from 0 to more than 20 feet. Between and around the islands, 0 to 50 feet of fine-grained sand, silt, and mud have been deposited as tidal flats and beach deposits. Additionally, much of the tidal

sediment has been covered by fill material of varying composition since the Shipyard was established in 1800 (McLaren/Hart, March 1994).

The naturally occurring soil material at the Shipyard is classified as Lyman fine sandy loam. In general, where the Lyman is still present, approximately the upper 2 to 4 feet of soil has been disturbed.

The surface of OU9 is primarily paved and used for parking, with grass and other vegetation northeast of Building 62. The soils in this area have been reworked over the years or consist of imported fill (e.g. 2007 fill material), and there is little to no evidence of native material (Lyman fine sandy loam) at the surface of OU9. The site is mapped as urban land (at least 85 percent of the surface covered with urban structures) in the soil survey for York County (USDA, 2009).

Excavation as part of the 2007 removal action was conducted across most of the site, excluding an unexcavated area in the northeastern portion where large trees are located along the shoreline (Figure 3-1). As-built drawings of pre-excavation, excavated, and post-excavation topographic conditions are provided in Appendix A. In the excavated area, surface fill consists of silty sand with some or no gravel. In the unexcavated area, surface soil consists of silty sand, silt/silty clay, and sand and gravel or gravel and small amounts of anthropogenic material such as ash and charcoal clinkers in irregular groupings, indicating that this material is likely a mixture of reworked native material and historical fill.

3.4 GEOLOGY

This section discusses regional and OU9 geology.

3.4.1 Regional Geology

The islands comprising PNS are formed on bedrock highs of the Kittery Formation with thin veneers of glacial till, recent alluvium, and fill materials. The bedrock is part of the Merrimack Group, which includes the Kittery, Berwick, and Eliot Formations. These formations consist of a variety of coarse-grained to fine-grained meta-sedimentary rocks that have been folded, faulted, and metamorphosed. The resulting rocks consist of schist, phyllite, quartzite, and slate. Plutonic rocks, primarily granite, diorite, and quartz monzonite, have intruded the Merrimack Group and generally occur in lenticular bodies that parallel the structural trend. The general structural trend is northeast (strike of faults and fold axes) (Halliburton NUS, November 1995).

As a result of erosion, the bedrock formations have been leveled and now have a gently uneven surface of low relief. Near the bedrock surface, fractures are pervasive due to weathering of the rock. On hills and ridges, weathered bedrock is veneered by glacial till, a result of the most recent glaciation

(Wisconsinan). Other unconsolidated materials located along the coastal areas consist of beach deposits and tidal flats.

3.4.2 OU9 Geology

Borings have been advanced at OU9 as part of the SSI (2003), Ash Extent Investigation (2004) and RI (2009 and 2010). Soil borings ranged in depth from 1 foot at 34-HA-3 (northern edge of OU9 near the shoreline) to 17 feet at OU9-07 (central portion of OU9 under Building 62). Appendix A provides a table of boring locations at OU9, their associated investigations, total depths, ground surface elevations (surveyed or estimated), and if applicable survey information, refusal depths, and depths to bedrock.

Detailed geologic cross sections were developed for OU9 using the available boring logs (provided in Appendix A). Figure 3-1 shows cross-section line locations, and Figures 3-2 through 3-7 display the detailed geologic cross-sections.

The majority of the current topography at OU9 was created by 2007 soil backfilling. Fill material is present across the site from the ground surface to a maximum depth of approximately 5.5 feet bgs near pre-2007 sample locations 34-134 and 34-12. Based on depths to refusal during several different investigations, the bedrock surface generally slopes to the north toward the Back Channel. Bedrock depths across the site vary from 1 to 17 feet bgs. Bedrock is 1 at foot bgs at pre-2007 sample location 34-HA-3 along the shoreline and is deepest at approximately 17 feet bgs at 2009 sample location OU9-07 under Building 62.

Subsurface materials at OU9 include bedrock; native material; reworked native material; historical fill; and 2007 fill material. The bedrock at OU9 consists of a dark gray or greenish-gray quartzite. Native material is typically silty sand directly overlaying the bedrock. Silty sand, silt/silty clay, and sand and gravel or gravel present as mixtures varying in composition and distribution, both laterally and vertically, are identified as reworked native fill and historic fill. Burned material within the reworked native material and historical fill can include furnace slag, charcoal clinkers, coal chips, charred wood, charred terra cotta, and/or glass fragments, depending on the location at the site. In the small isolated pockets where ash remains, it is described as black, fine to coarse, crumbly, platy ash with or without coal chips, furnace slag, charcoal clinkers, or sand-sized white particles that may be within a matrix of reworked native material. The 2007 fill material consists of silty sand with some to no gravel. In the cross-sections, zones referred to as 2007 fill, contain no burned materials.

3.4.2.1 Cross-Section Description

Cross-sections A-A', B-B', C-C', D-D', E-E', and F-F' (Figures 3-2 to 3-7) show the nature and extent of surface and subsurface materials at OU9. On each cross-section, a line is depicted that represents the

2007 profile. The elevations for the cross-sections are based on the Site 34 Removal Action Report (Shaw, July 2008) and the 2009 and 2010 boring log information.

Cross-Section A-A'

Cross-section A-A' (Figure 3-2) represents an east-west section of OU9, passing north of Building 62 toward Building 376. The bedrock surface is fairly level along this cross-section, approximately 5 feet bgs (109.5 feet) near the northwestern corner of Building 62 Annex at boring 34-100 and 6.5 feet bgs (111.5 feet) near the northwestern corner of Building 376 at boring 34-123.

Material below the 2007 excavation surface consists of noncontiguous zones of silty sand, silt/silty clay, and sand and gravel or gravel, indicating that this material is likely a mixture of reworked native material and historical fill. Some ash is expected to remain in the vicinity of 34-07 and 34-11A after the 2007 soil excavation, but this was not confirmed by post-2007 borings. Material above the excavation surface is backfill material placed at completion of the 2007 soil removal. This fill material consists of silty sand with little to no gravel. The top 6 inches is topsoil.

Cross-Section B-B'

Cross-section B-B' (Figure 3-3) represents a north-south section in the central portion of OU9, passing through Building 62 and continuing toward the riprap shoreline. The bedrock surface decreases in elevation from Building 43 north toward the riprap. The bedrock surface is approximately 12 feet bgs (107.6 feet) at boring 34-01. A bedrock low is present in the area of OU9-07 (102.7 feet), and a bedrock high is present in the area of OU9-08 (110.71 feet). Then, the bedrock surface slopes from the bedrock high to approximately 11 feet bgs (100.48 feet) at 34-17 near the riprap.

Material below the 2007 excavation surface consists of noncontiguous zones of silty sand, silt/silty clay, sand and gravel or gravel, indicating that this material is likely a mixture of reworked native material and historical fill. Some ash and burned material (coal chunks, slag, glass fragments, and charred terra cotta) remains after the 2007 soil excavation at the northern end of the cross-section near the riprap, and its presence was confirmed by post-2007 borings OU9-13 and OU9-22. It could not be determined whether residual ash remains between the area north of the subsurface ash pocket found near OU9-22 and riprap because no samples could be taken in that area due to the presence of a water line. Material above the excavation surface is backfill material placed at completion of the 2007 soil removal. This fill material consists of silty sand with little to no gravel. The ground surface south of Building 62 is paved with asphalt, the ground surface inside of Building 62 is concrete with a sand and gravel base, and the ground surface north of Building 62 consists of topsoil and/or grass.

Cross-Section C-C'

Cross-section C-C' (Figure 3-4) represents an east-west section of OU9, starting near the southwestern corner of Building 62 Annex passing south of Building 62 and extending toward Building 376. The bedrock surface is fairly flat along this cross-section, approximately 8 feet bgs (108.03 feet) near the southwestern corner of Building 62 Annex (OU9-25) and 12 feet bgs (107.5 feet) near Building 376 at 34-116. A bedrock high is located from boring 34-103, near the southwestern corner of Building 62 Annex, to 34-107, near the southwestern corner of Building 62, (averaging 112.5 feet).

Material below the 2007 excavation surface consists of silty sand, silt/silty clay, sand and gravel or gravel; this material is likely a mixture of reworked native material and historical fill. A small layer of ash is expected to remain after the 2007 soil excavation in the vicinity of boring 34-116, and some burned material (charcoal clinkers and slag) is expected to be present in the vicinity of borings 34-103 and 34-115, but its presence was not confirmed by post-2007 borings. Material above the excavation surface is backfill material placed at completion of the 2007 soil removal. This fill material consists of silty sand with little to no gravel. Along this cross-section, the top 1 to 1.5 feet of ground surface consists of asphalt with a gravel subase.

Cross-Section D-D'

Cross-section D-D' (Figure 3-5) represents a north-south section across the western portion of OU9 passing through Building 62 Annex. The bedrock surface elevation gradually decreases from the south to the north, from approximately 5 feet bgs (112.9 feet) at 34-253 to 6 feet bgs (107.86 feet) at 34-228.

Material below the 2007 excavation surface consists of silty sand, silt/silty clay, sand and gravel or gravel; this material is likely a mixture of reworked native material and historical fill. Some ash is expected to remain after the 2007 soil excavation in the vicinity of boring 34-11A, and burnt material (charcoal clinkers and slag) is expected to be present in the vicinity of 34-204, but neither was confirmed by post-excavation borings. Material above the excavation surface is backfill material placed at completion of the 2007 soil removal. This fill material consists of silty sand with little to no gravel. The ground surface south of Building 62 Annex is paved with asphalt, the ground surface inside of Building 62 Annex is concrete with a sand and gravel base, and the ground surface north of Building 62 Annex consists of gravelly sandy topsoil.

Cross-Section E-E'

Cross-section E-E' (Figure 3-6) represents a north-south section across the eastern portion of OU9 starting near the northeastern corner of Building 43 and extending toward the shoreline. The bedrock

surface elevation gradually increases from the south to the north, from approximately 10 feet bgs (109.38 feet) at 34-114 to 1 feet bgs (113.13 feet) at 34-HA-3.

Material below the 2007 excavation surface consists of incontiguous zones of silty sand, silt/silty clay, sand and gravel indicating that this material is likely a mixture of reworked native material and historical fill. Some burned material (charcoal clinkers) is expected to be present in the vicinity of 34-126, 34-HA-8, and 34-HA-3, but this was not confirmed by post-2007 borings. Material above the excavation surface is backfill material placed at completion of the 2007 soil removal. This fill material consists of silty sand with little to no gravel. South of 34-124-125MID, the ground surface is paved with asphalt; and north of 34-124-125MID, the ground surface consists of grass and topsoil.

Cross-Section F-F'

Cross-section F-F' (Figure 3-7) represents an east-west section across the northernmost portion of OU9 in the unexcavated area near the shoreline. The bedrock surface varies across the cross-section. Depth to bedrock is approximately 4.5 feet bgs (108.8 feet) in the west at OU9-01. A bedrock high exists from 34-HA-5 to 34-HA-1, averaging approximately 2 feet bgs (113 feet), a bedrock low is present near OU9-04 (108 feet), then the bedrock surface elevation increases to approximately 112.02 feet near 34-219A before sloping down to about 109.5 feet near OU9-06. The irregularity in the bedrock surface suggests that refusal in some borings was due to a boulder or cobble and not the true bedrock surface.

The 2007 soil excavation did not extend into the area of cross-section F-F' in order to preserve large mature trees. Material above the bedrock surface consists of incontiguous zones of silty sand, silt/silty clay, sand and gravel or gravel, indicating that this material is likely a mixture of reworked native material and historical fill. Some burned material (charcoal clinkers, slag, charred wood, and/or coal chips) is present in limited amounts in the vicinity of OU9-01, 34-HA-5, 34-HA-1, and 34-219A, and ash is present in small pockets near OU9-04. The ground surface along this cross-section consists of grass and topsoil.

3.4.2.2 Residual Ash Evaluation

The percentage of ash remaining in overburden at OU9 was estimated using pre- and post-excavation boring logs (See Appendix A.1 for methodology and calculations). Based on the evaluation of the 2009 and 2010 borings, and estimations of ash remaining in 2003 and 2004 boring logs, approximately 5 percent of the overburden material at OU9 contains ash/burnt material. Where ash is present in the excavated area, the average depth at which ash is encountered is 3 feet and it is generally 0.8 feet thick. Where ash is present in the unexcavated area, the average depth at which ash is encountered is 0.8 feet and it is generally 0.4 feet thick.

3.4.3 Summary of OU9 Geology

The following summarizes OU9 geology:

- The surface of OU9 consists primarily of paved areas used for parking, with grass and other vegetated areas northeast of Building 62.

- Material above the 2007 excavation surface is backfill material placed at completion of the 2007 soil removal. This fill material consists of silty sand with little to no gravel.

- Material below the 2007 excavation surface consists of silty sand, silt/silty clay, sand and gravel or gravel present principally in noncontiguous variable zones indicating that this material is likely a mixture of reworked native material and historical fill. Isolated pockets of ash and burnt material are also present.

- Approximately 5 percent of the overburden at OU9 is estimated to contain ash/burnt material. The average depth of ash encountered in the excavated area is 3 feet and it is generally 0.8 feet thick. The average depth at which ash is encountered in the unexcavated area is 0.8 feet and it is generally 0.4 feet thick.

- Small areas of silty sand, interpreted as native material, were encountered overlying bedrock.

- The bedrock surface generally slopes north toward the Back Channel.

3.5 HYDROGEOLOGY

The following describes hydrogeology of PNS and OU9. A detailed description of the hydrogeology of PNS is provided in the RCRA Facilities Investigation (RFI) Data Gap Report (Halliburton NUS, November 1995), which also provides detailed figures showing groundwater elevations at the facility at high tide and low tide, and salinity data. Several other reports have detailed information pertaining to the hydrogeology at PNS including the RFI (McLaren/Hart, July 1992) and Groundwater Monitoring Summary Report (Tetra Tech, August 1999). These reports include estimates of hydraulic conductivities, groundwater elevations during several sampling events, and summaries of other hydrogeologic observations (e.g., tidal data, groundwater quality during sampling, etc.). The discussion of the hydrogeology at OU9 is based principally on data collected during the 2003 SSI and 2004 Ash Extent Investigation.

3.5.1 Portsmouth Naval Shipyard General Hydrogeology

Groundwater is encountered within both unconsolidated materials and bedrock at the facility. In general, unconsolidated overburden materials are moderately to highly permeable. Bedrock permeability is generally less than that of unconsolidated materials. Groundwater in bedrock occurs principally in fractures that intersect and enable groundwater to potentially travel in various directions. Near the bedrock surface, fractures are pervasive because of weathering of the rock. The size and interconnectedness of the fractures generally decrease with depth, potentially limiting the movement of groundwater.

Groundwater levels in the overburden at PNS are shallow. Groundwater flow directions generally mimic bedrock surface topography and are influenced by the thickness and composition of the overburden and tidal fluctuations. Overall, groundwater flow directions are from the original island interior toward the current coastline. The overall conceptual model of groundwater flow at the facility is that fresh groundwater originating from precipitation in the island interior flows downward and outward through both the overburden and bedrock. Tidal effects near the shorelines result in a localized back-and-forth movement of water between the overburden and bedrock; however, the net groundwater flow is outward into the Piscataqua River. Groundwater flow at PNS is a localized system that is not affected by the mainland groundwater flow system.

For all areas along the coastline at PNS, tides play an important role in the hydrogeology. The Piscataqua River is a tidal estuary with diurnal tidal changes of up to 8 feet. At low tide, groundwater flow through the bedrock underlying the island interior has both lateral and downward components. At some locations in filled areas, groundwater in shallow bedrock moves upward toward the overburden. At some locations along the perimeter of the facility, there are upward gradients from deeper bedrock toward shallow bedrock. These do not imply an actual discharge at these locations. The point of discharge for groundwater in deep bedrock depends on the relative strengths of the vertical and lateral components of flow and the sizes and interconnections of fractures between the deeper bedrock and more shallow bedrock.

At low tide, groundwater flow directions essentially mimic the bedrock surface. From areas of high bedrock elevations on the original island, fresh water from precipitation infiltrates through the overburden into bedrock and moves downward and laterally toward the filled areas. Hydraulic gradients are steepest where the bedrock surface slope is steepest and are less steep where the bedrock has a gentler slope. As groundwater moves toward the fill areas, groundwater elevations continue to decline and are similar in the bedrock and overburden. Vertical flow components in bedrock are downward within the interior of the original island. At high tide, vertical gradients may reverse depending on the degree of seawater intrusion from the Piscataqua River into the overburden and hydraulic loading on the bedrock. Seawater intrusion

is primarily enhanced by greater hydraulic conductivities, higher tidal elevations, and weaker opposing freshwater gradients from the upgradient source area. The load on groundwater bedrock is increased by seawater intrusion, the weight of water in the overburden, and a hydraulic connection to the tidal load.

PNS does not use groundwater for any purpose. Potable water is supplied to PNS from the Kittery Water District. Kittery's potable water supply originates from surface reservoirs located in the vicinity of York, Maine.

3.5.2 OU9 Hydrogeology

Temporary groundwater wells were installed at five soil boring locations in 2003: TW01 (34-01), TW02 (37-17), TW03 (34-04), TW04 (34-05), and TW05 (34-02). Although some intervals in the borings were noted as moist or wet during drilling, none of the wells produced groundwater. Field personnel visited the five wells during mid- and high-tide conditions and determined that each well was dry [see Section 2.3.3 of the Site 34 Site Investigation Data Package (Tetra Tech, August 2004)]. The well screens were installed below the elevation of ash and between 101 to 112 feet. For comparison, the mean high and low tide elevations at PNS are 100.4 and 92.2 feet, respectively. Therefore, tidal water is not expected to enter the overburden material at this site. During the 2004 Ash Extent Investigation, soils were generally dry to moist at all boring locations (Tetra Tech, September 2005). Soils were not saturated at any soil boring location. Given the lack of groundwater in the wells installed in the overburden and the overburden elevation relative to high tide, it is apparent that groundwater is not present in the overburden materials at the site. As discussed in Section 1.1 and detailed in Section 5.1, bedrock groundwater was not investigated; therefore, site-specific information on bedrock groundwater conditions are not available.

3.6 SURFACE WATER USE AND HYDROLOGY

About 3 miles inland from the Atlantic Ocean, PNS is located at the mouth of a broad tidal basin for inland rivers that comprise the Great Bay Estuary. The Great Bay Estuary is strongly influenced by tides, and the Piscataqua River is an ocean-dominated system. The City of Portsmouth lies on the western banks of the Piscataqua River. On the opposite bank of the Piscataqua is the Town of Kittery, Maine, in which PNS is located. The only seaport in the State of New Hampshire, Portsmouth has one of the deepest harbors in the world (Answers.com, June 2008).

Portsmouth Harbor's main channel is approximately 75 feet deep (mean low water), and the Back Channel is approximately 20 feet deep (mean low water) in the vicinity of Seavey Island. The salinity of the surface water exceeds 20 parts per thousand (ppt); therefore, surface water in the area is not suitable for drinking (McLaren/Hart, March 1994). Commercial, recreational boating, and lobstering activities are conducted in the Back Channel in the general vicinity of OU9.

Much of the shoreline of the estuary is undeveloped, but industrial activities in southeastern New Hampshire, such as foundries and tanneries, have discharged wastes into the estuary, especially from 1940 to 1976. There are many point-source and non-point-source discharges throughout the Great Bay Estuary, including permitted discharges (Tetra Tech, October 1999). According to the Strafford Regional Planning Area New Hampshire Regional Master Plan (May 2005), 44 communities are located in the New Hampshire portion of the Piscataqua River Basin, including the Great Bay Estuary and Coastal Drainage Area. Sixteen of the communities have municipal sewage treatment plants or wastewater treatment facilities (e.g., wastewater pollution control facilities). The nearest wastewater treatment plant to PNS is the Portsmouth Wastewater Treatment Facility located at Pierce Island, southwest of PNS (see Figure 1-1).

PNS is a well-developed, highly industrialized area, with limited natural surface water drainage. Surface water runoff at PNS is collected by an extensive storm water collection system that drains to the Piscataqua River. Direct surface water runoff also enters the Piscataqua River. Based on a flood zone map for the PNS area, the 100-year flood zone in the vicinity of OU9 is at an elevation of 105 feet. OU9 is at an elevation of approximately 120 feet; therefore, flooding of the site is not a concern.

According to the Maine Department of Marine Resources (DMR) regulations, effective February 2004 and updated in August 2008, because of pollution, it is unlawful to collect clams, quahogs, oysters, and mussels from the shores, flats, or waters of Kittery, Eliot, and South Berwick, northwest of a line across the Piscataqua River at the Memorial Bridge, and south of a line across the mouth of Spinney Creek at the Route 103 Causeway, which includes the PNS area. In addition, a special permit is required for a restricted area north of the line across the mouth of Spinney Creek at the Causeway (Maine DMR, August 2008).

The New Hampshire Department of Environmental Services (NHDES) is responsible for classification of shellfish-growing waters to determine whether water quality is acceptable for shellfish harvesting. NHDES uses the National Shellfish Sanitation Program to establish criteria and methodology to classify shellfish-growing waters. The river waters around PNS are currently closed for shellfish harvesting, due to fecal coliform bacterial loading from wastewater treatment plants, as detailed in the NHDES Shellfish Program: 2005 Annual Report (NHDES, June 2006).

Semi-diurnal tidal currents, the horizontal motions associated with tidal changes in water levels, predominate in Portsmouth Harbor. Near Seavey Island, the mean tidal range is 8.1 feet. The overall ebb and flood currents in the vicinity of PNS are high. The average flood currents range from 3.0 knots south of Seavey Island to 3.3 knots southwest of Badgers Island (located approximately 1,000 feet east of

PNS). The average ebb currents are 3.8 knots south of Seavey Island and 3.7 knots southwest of Badgers Island. Because of the strong currents, most ships wait for favorable tides before moving up and down the narrow Piscataqua River. The estimated flushing rates of Portsmouth Harbor and the lower reaches of the Great Bay Estuary range from 3.3 to 6.3 tidal cycles (McLaren/Hart, March 1994).

3.7 ECOLOGY

PNS is a highly developed industrial property with limited vegetative growth. A few areas at PNS, such as Clark's Island, have habitat for ecological receptors, but most of the ground cover consists of landscaping plants, with only scattered remnants of naturally occurring species. Because of its general lack of habitat and the intensity of surrounding human and industrial activity, most of PNS is unattractive for most species of wildlife.

OU9 is mostly paved or covered with buildings. There is a grassy area with a few trees along the shoreline to the northeast. OU9 provides limited habitat for some of ecological receptors as discussed herein.

No known endangered, threatened, or protected species or critical habitats are located within the boundaries of PNS, including OU9. PNS is not included in the critical habitats of any species (Maine Fisheries and Wildlife, January 1989; NFEC, August 1993). The Soil and Water Conservation Land Management Plan (Soil Conservation Service, August 1985) notes that Northern Bald Eagles are known to use the Great Bay Estuary. Also, this plan indicates that piping plover may possibly exist at the mouth of the Piscataqua River. Regarding other significant habitats, Clark's Island was noted to require special consideration because of its use by colonial nesting seabirds (nesting season is from April 1 to August 15). Clark's Island, on the eastern side of PNS, is not located near the vicinity of OU9.

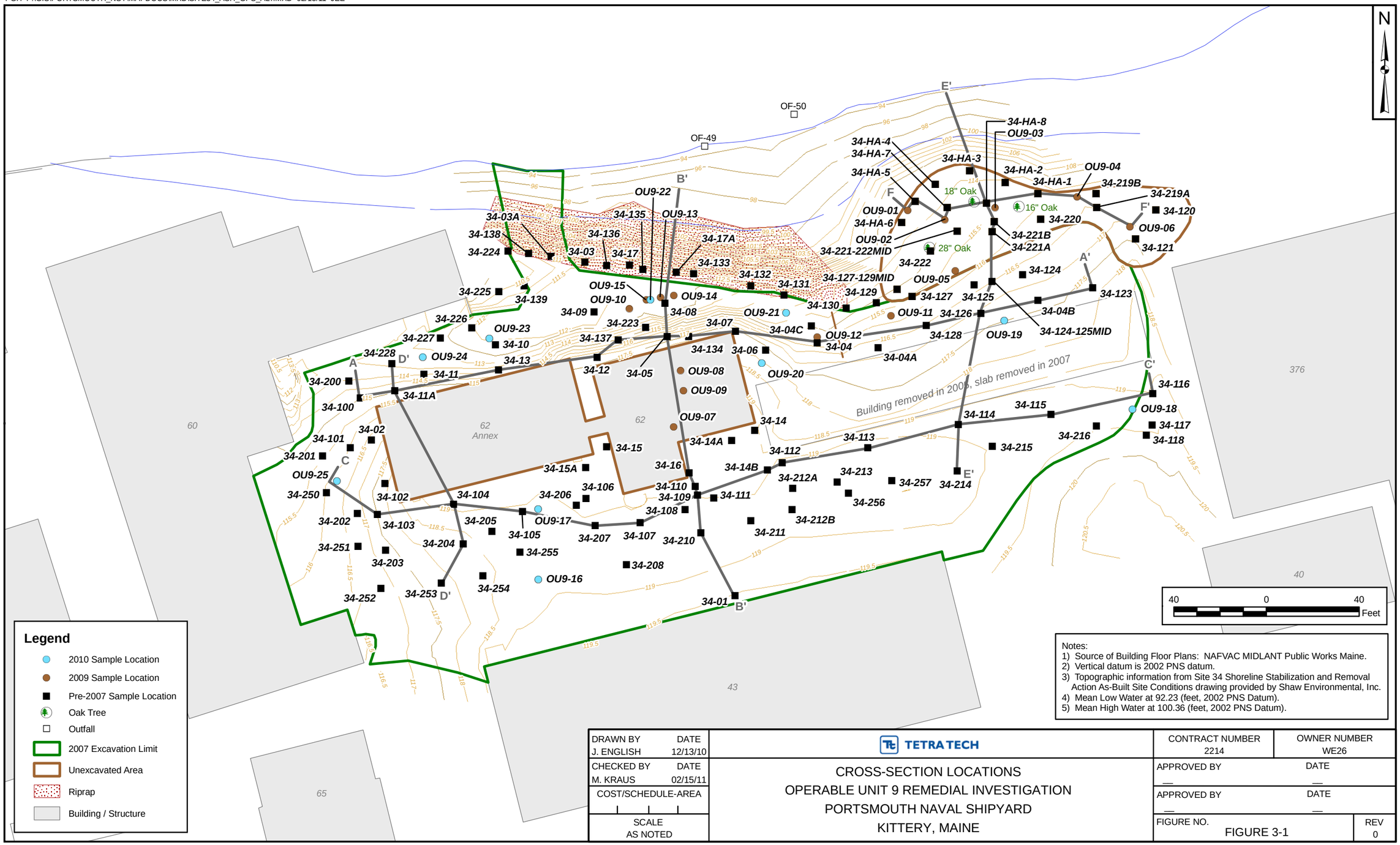
The habitat offshore of OU9 consists of intertidal and subtidal habitats; the substrate is sandy and rocky. No eelgrass or saltmarsh habitats are present offshore of OU9, although mussels are present on the rocks in both the intertidal and subtidal areas. Because OU9 is located in an area where the Back Channel decreases in width, the water velocity of the river increases which limits the amount of deposition offshore of OU9, thereby leading to the sandy and rocky habitat.

3.8 CLIMATOLOGY

Climatology information was taken from the NOAA internet site for the National Climatic Data Center Office with data from the Portland, Maine, weather station, which is the NOAA coastal weather station closest to PNS. The climatological data for Portland, Maine, are based on mean observations from 1975 to 2006 (NOAA, January 2007). Precipitation (including liquid water equivalent for snowfall) is fairly

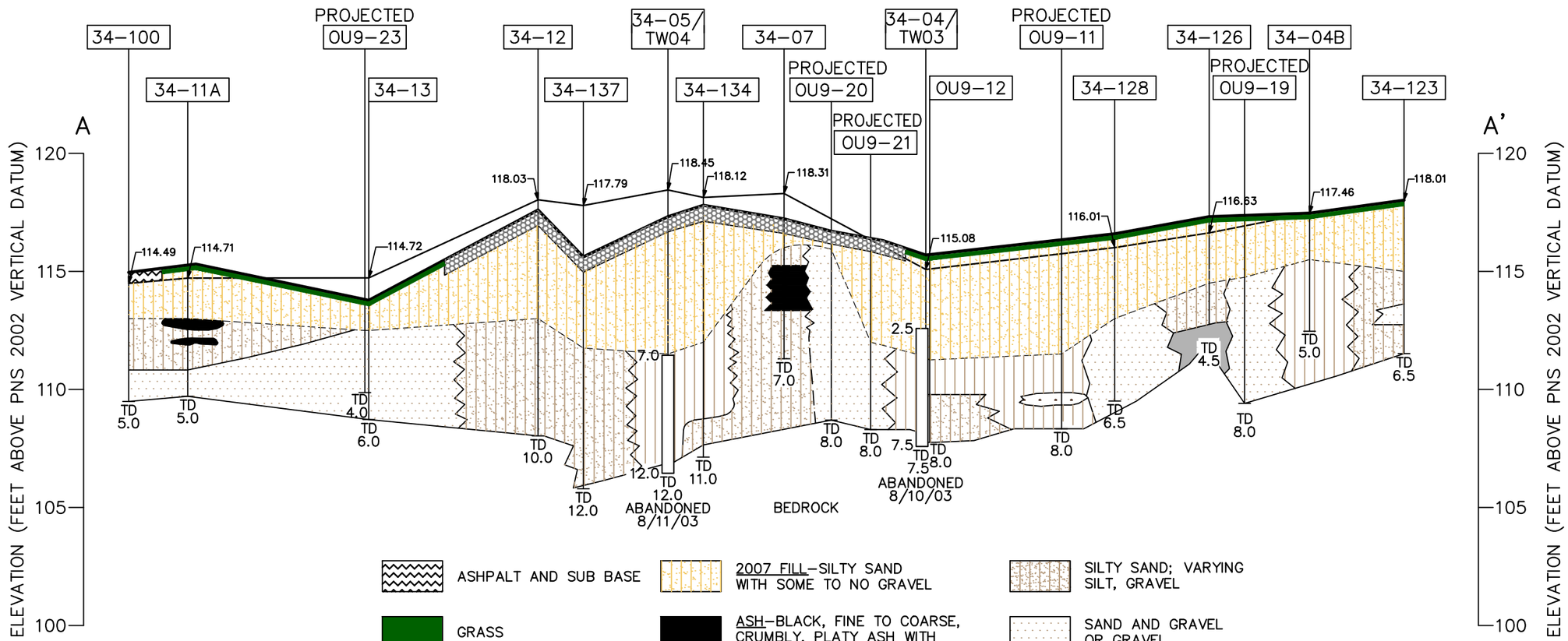
evenly distributed over the year, with approximately 3 to 5 inches falling per month, for an annual total of approximately 46 inches for Portland. Monthly average temperatures for Portland range from approximately 20 to 40 degrees Fahrenheit (°F) from November through April and from approximately 50 to 70 °F from May to October. Snowfall occurs mostly from November to April, with a little snow occurring in October and May. The annual snowfall is approximately 24 inches.

PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_ASH_GPS_ALT.MXD 02/15/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).

DRAWN BY J. ENGLISH	DATE 12/13/10	TETRA TECH	CONTRACT NUMBER 2214 / OWNER NUMBER WE26
CHECKED BY M. KRAUS	DATE 02/15/11	CROSS-SECTION LOCATIONS OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 3-1 / REV 0



ASHPALT AND SUB BASE

GRASS

CRUSHED STONE

2007 FILL–SILTY SAND WITH SOME TO NO GRAVEL

ASH–BLACK, FINE TO COARSE, CRUMBLY, PLATY ASH WITH OR WITHOUT COAL CHIPS, FURNACE SLAG, CHARCOAL CLINKERS, OR SAND–SIZED WHITE PARTICLES THAT MAY BE WITHIN A MATRIX OF REWORKED NATIVE MATERIAL.

BURNED MATERIAL–FURNACE SLAG, CHARCOAL CLINKERS, CHARRED WOOD, CHARRED TERRA COTTA, AND/OR GLASS FRAGMENTS WITHIN A MATRIX OF REWORKED NATIVE MATERIAL. DOES NOT CONTAIN ASH.

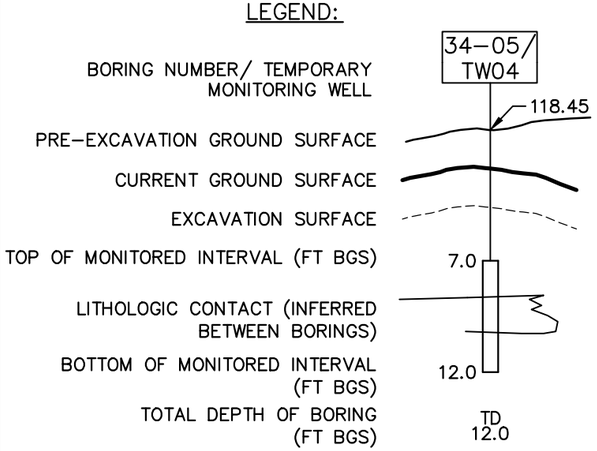
SILTY SAND; VARYING SILT, GRAVEL

SAND AND GRAVEL OR GRAVEL

SILT/SILTY CLAY

ORGANIC

LEGEND:



0 30 60
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921–7090 | F: (412) 921–4040

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

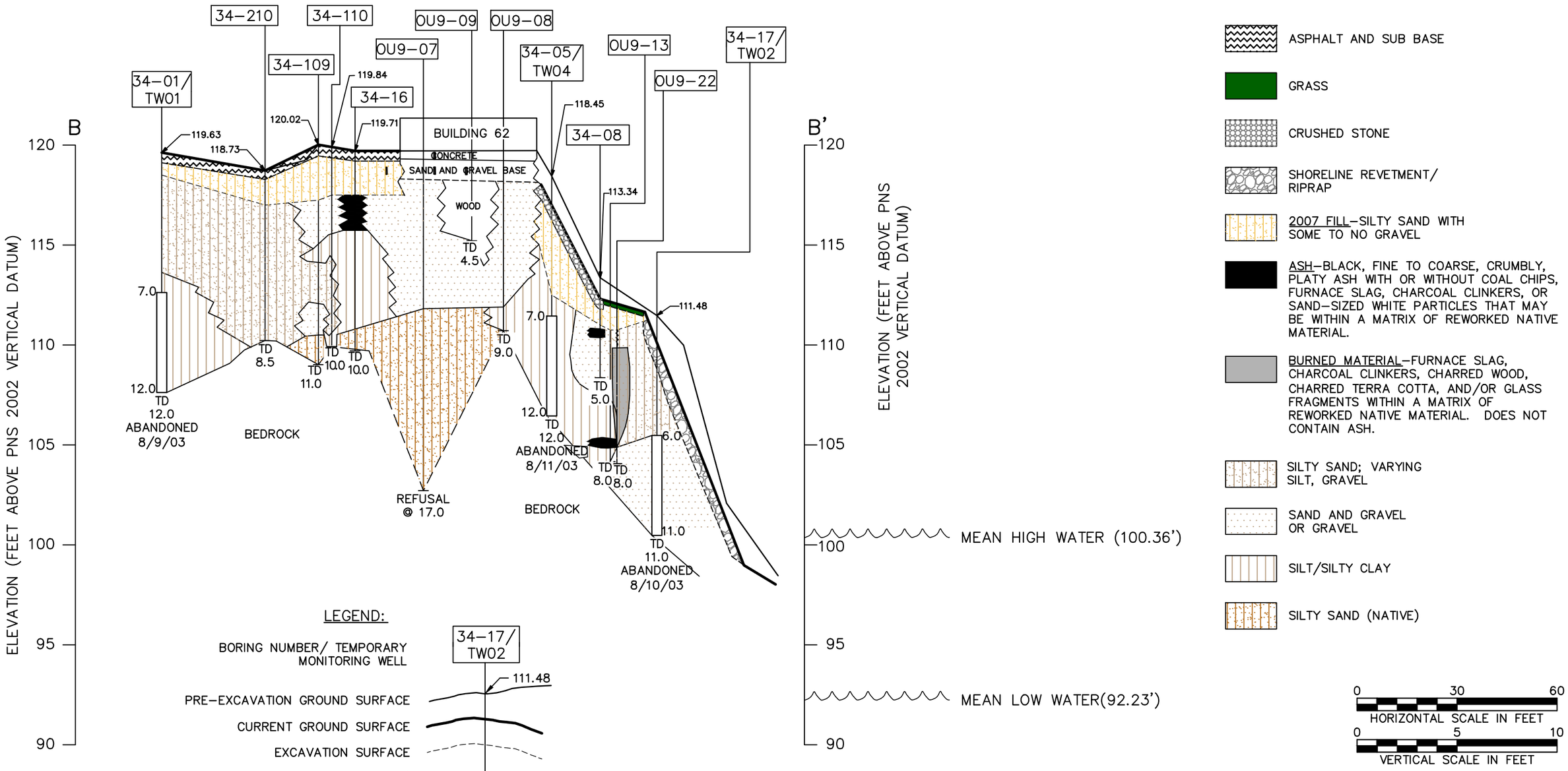
GEOLOGICAL CROSS–SECTION A–A'
OPERABLE UNIT 9

SCALE: AS NOTED

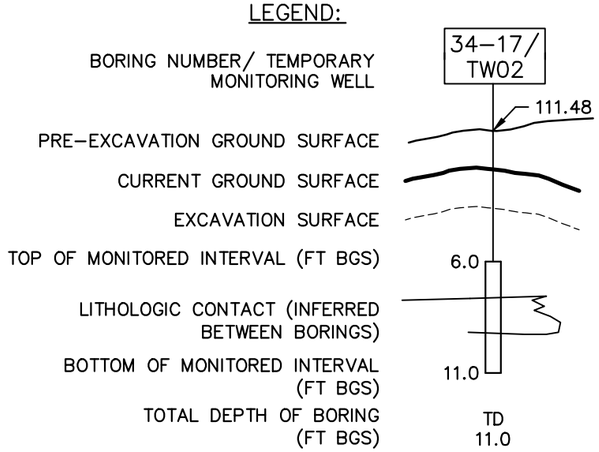
DATE:	10/27/10
PROJECT NO.:	112G01456
DESIGNED BY:	
DRAWN BY:	CK
CHECKED BY:	
SHEET:	1 OF 6

COPYRIGHT TETRA TECH INC.

FIGURE 3–2



LEGEND:



TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

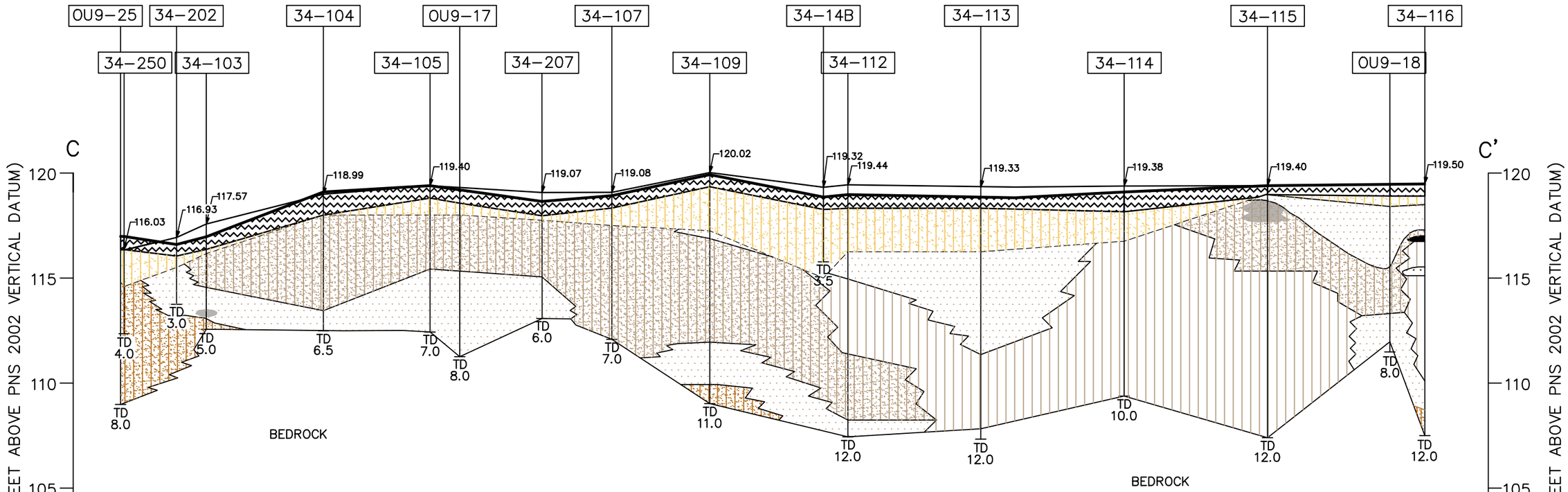
GEOLOGICAL CROSS-SECTION B-B'
OPERABLE UNIT 9

SCALE: AS NOTED

DATE:	10/27/10
PROJECT NO.:	112G01456
DESIGNED BY:	
DRAWN BY:	ND
CHECKED BY:	
SHEET:	2 OF 6

COPYRIGHT TETRA TECH INC.

FIGURE 3-3



ASPHALT AND SUBBASE

2007 FILL–SILTY SAND WITH SOME TO NO GRAVEL

ASH–BLACK, FINE TO COARSE, CRUMBLY, PLATY ASH WITH OR WITHOUT COAL CHIPS, FURNACE SLAG, CHARCOAL CLINKERS, OR SAND–SIZED WHITE PARTICLES THAT MAY BE WITHIN A MATRIX OF REWORKED NATIVE MATERIAL.

BURNED MATERIAL–FURNACE SLAG, CHARCOAL CLINKERS, CHARRED WOOD, CHARRED TERRA COTTA, AND/OR GLASS FRAGMENTS WITHIN A MATRIX OF REWORKED NATIVE MATERIAL. DOES NOT CONTAIN ASH.

SAND AND GRAVEL OR GRAVEL

SILTY SAND; VARYING SILT, GRAVEL

PEAT

SILT/SILTY CLAY

SILTY SAND (NATIVE)

LEGEND:

BORING NUMBER — 34–104

PRE–EXCAVATION GROUND SURFACE — 118.99

CURRENT GROUND SURFACE

EXCAVATION SURFACE

LITHOLOGIC CONTACT (INFERRED BETWEEN BORINGS)

TOTAL DEPTH OF BORING (FT BGS) — TD 6.5

0 30 60
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921–7090 | F: (412) 921–4040

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

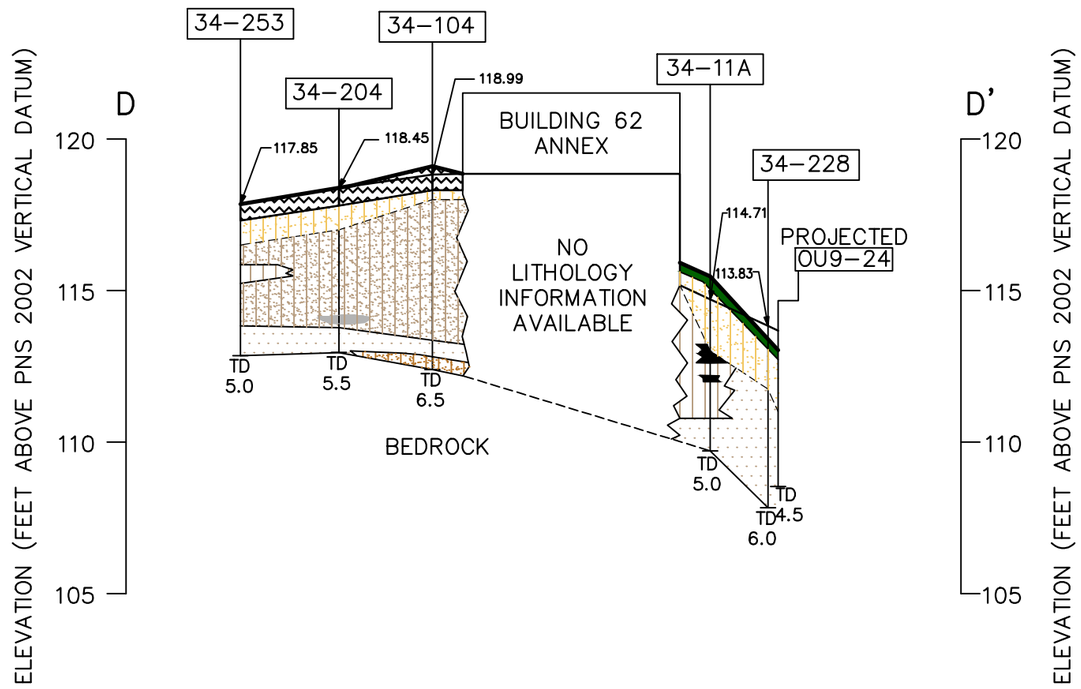
GEOLOGICAL CROSS–SECTION C–C'
OPERABLE UNIT 9

SCALE: AS NOTED

DATE:	10/27/10
PROJECT NO.:	112G01456
DESIGNED BY:	
DRAWN BY:	CK
CHECKED BY:	
SHEET:	3 OF 6

COPYRIGHT TETRA TECH INC.

FIGURE 3–4



ASPHALT AND SUBBASE

GRASS

2007 FILL–SILTY SAND WITH SOME TO NO GRAVEL

ASH–BLACK, FINE TO COARSE, CRUMBLY, PLATY ASH WITH OR WITHOUT COAL CHIPS, FURNACE SLAG, CHARCOAL CLINKERS, OR SAND–SIZED WHITE PARTICLES THAT MAY BE WITHIN A MATRIX OF REWORKED NATIVE MATERIAL.

SILTY SAND; VARYING SILT, GRAVEL

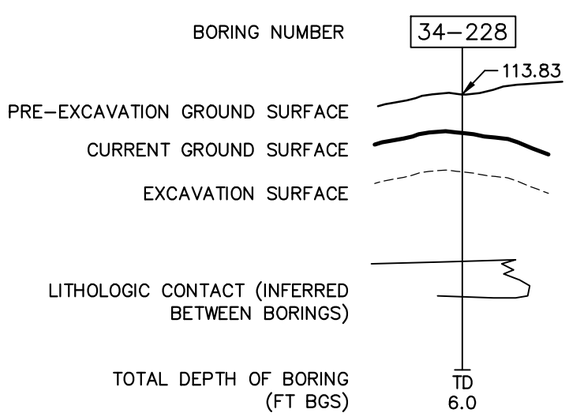
SILT/SILTY CLAY

BURNED MATERIAL–FURNACE SLAG, CHARCOAL CLINKERS, CHARRED WOOD, CHARRED TERRA COTTA, AND/OR GLASS FRAGMENTS WITHIN A MATRIX OF REWORKED NATIVE MATERIAL. DOES NOT CONTAIN ASH.

SAND AND GRAVEL OR GRAVEL

SILTY SAND (NATIVE)

LEGEND:



0 30 60
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921–7090 | F: (412) 921–4040

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

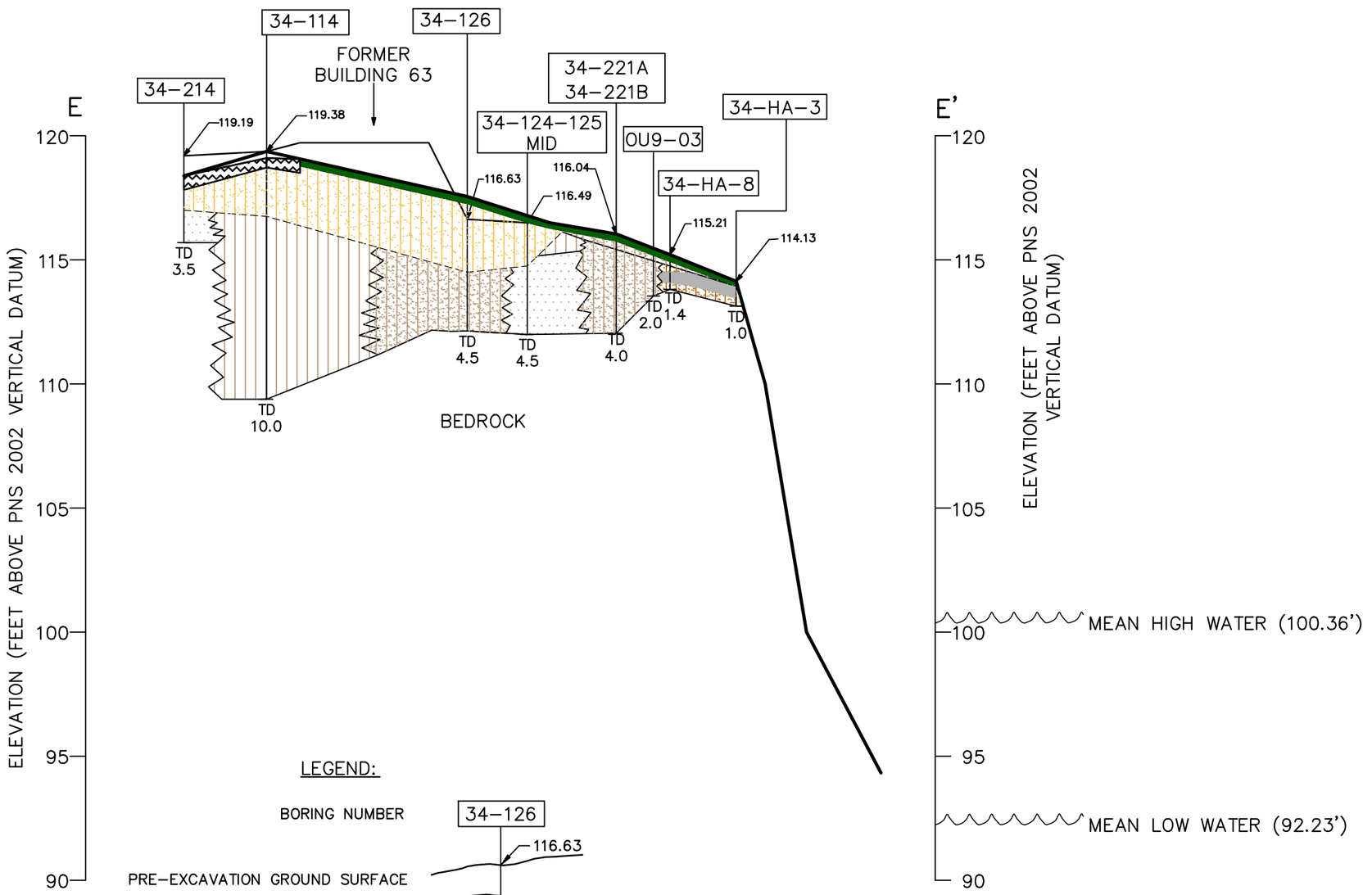
GEOLOGICAL CROSS–SECTION D–D'
OPERABLE UNIT 9

SCALE: AS NOTED

DATE:	10/27/10
PROJECT NO.:	112G01456
DESIGNED BY:	
DRAWN BY:	ND
CHECKED BY:	
SHEET: 4 OF 6	

COPYRIGHT TETRA TECH INC.

FIGURE 3–5



ASPHALT AND SUBBASE

GRASS

2007 FILL–SILTY SAND WITH SOME TO NO GRAVEL

SILTY SAND; VARYING SILT, GRAVEL

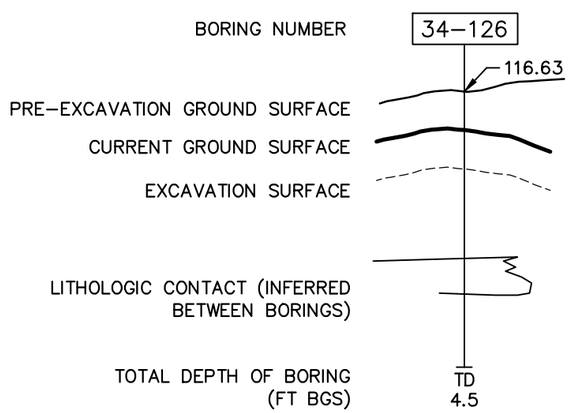
BURNED MATERIAL–FURNACE SLAG, CHARCOAL CLINKERS, CHARRED WOOD, CHARRED TERRA COTTA, AND/OR GLASS FRAGMENTS WITHIN A MATRIX OF REWORKED NATIVE MATERIAL. DOES NOT CONTAIN ASH.

SILT/SILTY CLAY

SAND AND GRAVEL OR GRAVEL

SILTY SAND (NATIVE)

LEGEND:



0 30 60
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

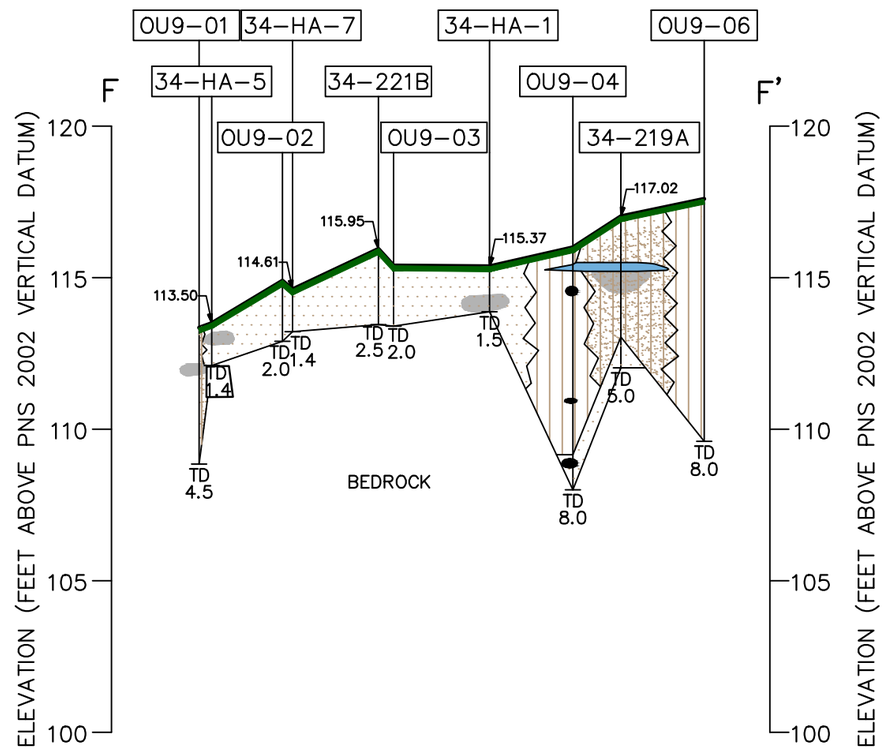
GEOLOGICAL CROSS-SECTION E-E'
OPERABLE UNIT 9

SCALE: AS NOTED

DATE:	10/27/10
PROJECT NO.:	112G01456
DESIGNED BY:	
DRAWN BY:	ND
CHECKED BY:	
SHEET: 5 OF 6	

COPYRIGHT TETRA TECH INC.

FIGURE 3-6



GRASS

SILTY SAND; VARYING SILT, GRAVEL

SILT/SILTY CLAY

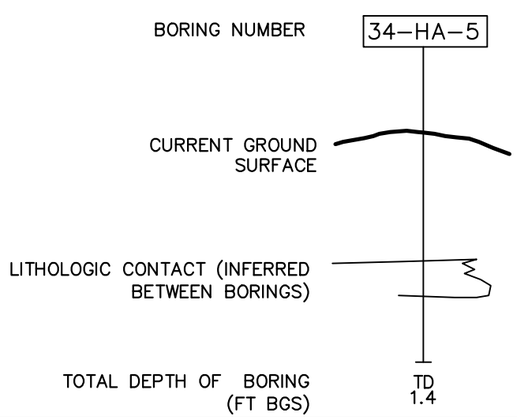
SAND AND GRAVEL OR GRAVEL

PLASTIC SHEETING

BURNED MATERIAL—FURNACE SLAG, CHARCOAL CLINKERS, CHARRED WOOD, CHARRED TERRA COTTA, AND/OR GLASS FRAGMENTS WITHIN A MATRIX OF REWORKED NATIVE MATERIAL. DOES NOT CONTAIN ASH.

ASH—BLACK, FINE TO COARSE, CRUMBLY, PLATY ASH WITH OR WITHOUT COAL CHIPS, FURNACE SLAG, CHARCOAL CLINKERS, OR SAND-SIZED WHITE PARTICLES THAT MAY BE WITHIN A MATRIX OF REWORKED NATIVE MATERIAL.

LEGEND:



0 30 60
HORIZONTAL SCALE IN FEET

0 5 10
VERTICAL SCALE IN FEET

TETRA TECH
WWW.TETRATECH.COM
661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

GEOLOGICAL CROSS-SECTION F-F'
OPERABLE UNIT 9

SCALE: AS NOTED

DATE:	10/27/10
PROJECT NO.:	112G01456
DESIGNED BY:	
DRAWN BY:	CK
CHECKED BY:	
SHEET: 6 OF 6	

COPYRIGHT TETRA TECH INC.

FIGURE 3-7

4.0 NATURE AND EXTENT OF CONTAMINATION

The discussion of the nature and extent of contamination at OU9 focuses on the distribution of chemical concentrations across OU9 with consideration of areas included and excluded from the removal action and geological conditions. This section discusses the sources of contamination, magnitudes, and extent of contaminants present in surface and subsurface soil at OU9.

As discussed in Section 1.0, oil gasification and blacksmithing operations resulted in the release of contamination at OU9 in the form of ash produced during coal combustion. An SSI and two ash removal projects were performed at OU9 between 1999 and 2007. During the SSI, PAHs, antimony, lead, and mercury were identified as the OU9 chemicals of potential concern (COPCs) because they were detected at concentrations greatly exceeding industrial and residential RSLs. RI sampling was conducted to establish the presence or absence of ash and tar beneath Building 62 to support remedial decision-making, and to evaluate whether concentrations of PAHs, antimony, lead, and mercury pose unacceptable human health risks. No ash or tar was found beneath Building 62 during the RI sampling.

As discussed in Section 2.0, only the analytical data from RI sampling are included in this discussion of the nature and extent of contamination. The database printout is provided in Appendix D. Figures showing geological conditions and chemical concentrations across several cross sections are also included in Appendix A. These figures indicate whether fill material (from the 2007 removal action), burnt material, or ashes were observed in borings.

For the discussion on the nature and extent of contamination, concentrations were compared to USEPA residential and industrial RSLs (USEPA, November 2010) and to the maximum facility background detected concentrations (data provided in Appendix B) to provide a general understanding of the nature and extent of contamination.

4.1 SURFACE SOIL CONTAMINATION

During RI sampling events, 19 surface soil samples were analyzed for antimony, lead, mercury, and PAHs. Table 4-1 presents the summary statistics for antimony, lead, mercury, and PAHs detected in surface soil at OU9. Antimony and mercury concentrations in surface soil across the site were less than residential and industrial RSLs, and maximum facility background concentrations. Several lead and most PAH concentrations exceeded residential RSLs. Figures 4-1 and 4-2 provide tag maps of the surface soil locations where lead and PAH concentrations exceeded residential RSLs.

In the excavated area, all surface soil samples were characterized as backfill soils containing material placed as part of site restoration after the 2007 removal action. Concentrations of the three metals were generally low to very low, and concentrations of PAHs were moderate to low, relative to the range of site concentrations. All antimony and mercury concentrations and most lead concentrations were less than residential RSLs. As shown on Figure 4-1, only three samples had lead concentrations greater than the residential RSL, but all lead concentrations were less than the industrial RSL. Lead concentrations were also less than the maximum facility background concentration. Only the lead concentration in the duplicate sample at OU9-12 exceeded the industrial RSL. As discussed in Section 2.0, this elevated detection of lead was investigated further in 2010 and was found to not be consistent with any of the other detections of lead in backfill soils. As shown on Figure 4-2, concentrations of PAHs in the excavated area surface soil were generally similar to industrial levels.

In the unexcavated area, concentrations of the three metals were also generally low to very low and concentrations of PAHs were low, indicating that the unexcavated area was not impacted by contaminant releases from OU9. All antimony and mercury concentrations and most lead concentrations were less than the corresponding RSLs. As shown on Figure 4-1, two surface soil samples (at OU9-01 and OU9-03) had lead concentrations slightly greater than the residential RSL but less than the industrial RSL. Lead concentrations were less than the maximum facility background detected concentration with the exception of the lead result at OU9-12, which is considered to be an anomaly. As shown on Figure 4-2, concentrations of many PAHs were greater than residential RSLs but generally similar to acceptable industrial levels. Two surface soil samples were collected at borings OU9-01 and OU9-04 where coal chips and/or ash were observed in surface soil. However, concentrations of antimony, lead, mercury, and PAHs were not elevated in these samples compared with other samples in the unexcavated or excavated areas.

4.2 SUBSURFACE SOIL CONTAMINATION

During RI sampling events, 38 subsurface soil samples were analyzed for antimony, lead, mercury, and PAHs. Table 4-2 presents the summary statistics for antimony, lead, mercury, and PAH detections in subsurface soil at OU9. Antimony concentrations in subsurface soil across the site were less than residential and industrial RSLs and the maximum facility background concentration. Several lead and mercury concentrations, and most PAH concentrations exceeded corresponding residential RSLs. Figures 4-3, 4-4, 4-5, 4-6, and 4-7 provide tag maps of the subsurface soil locations where lead, mercury, and PAH concentrations exceed residential and industrial RSLs.

In the excavated area, most subsurface soil was reworked native material, historical fill, or 2007 backfill. Burnt material and/or ash were only found in subsurface soil north of Building 62 (at OU9-13, OU9-14, OU9-15, and OU9-22). Concentrations of the three metals were generally low to very low in

native/reworked soil, and concentrations of PAHs were moderate to low. All antimony and mercury concentrations and most lead concentrations were less than residential RSLs. As shown on Figure 4-3, five samples had lead concentrations greater than the residential RSL. The lead concentrations at those locations were similar to or less than the industrial RSL and the maximum facility background concentration. As shown on Figures 4-5, 4-6, and 4-7, around Building 62 Annex (borings OU9-16, OU9-17, OU9-23, OU9-24, and OU9-25), concentrations of PAHs in the subsurface were less than residential RSLs, whereas samples from the other borings around Building 62 without any burnt material or ash (OU9-10, OU9-11, OU9-12, OU9-18, OU9-19, OU9-20, and OU9-21) had PAH concentrations generally similar to or less than industrial RSLs and maximum facility background concentrations. One exception is the sample collected from 2 to 5 feet bgs at OU9-20, which had PAH concentrations greater than both screening and facility background levels. Soil observed in the 2-to-5 feet bgs section of this boring had a black color, whereas soils from other sections of the boring were described as brown.

For samples with burnt material and ash in the excavated area (OU9-13, OU9-14, OU9-15, and OU9-22), concentrations of the three metals were generally low; however, as shown on Figure 4-3 and 4-4, concentrations of lead at OU9-13 and OU9-15 and mercury at OU9-15 and OU9-22 exceeded residential RSLs. Lead concentrations were similar to the industrial RSL but less than the maximum facility background concentration. Mercury concentrations were less than the industrial RSL. As shown on Figures 4-5, 4-6, and, 4-7 PAH concentrations were very high in the borings north of Building 62, exceeding both screening and facility background concentrations by as much as several orders of magnitude. These concentrations of PAHs are similar to concentrations observed in ash samples collected during the SSI.

In the unexcavated area, concentrations of the three metals were again generally low to very low, and concentrations of PAHs were also low, relative to the rage of site concentrations. This indicates that the unexcavated area has not been impacted by contaminant releases from OU9. All antimony, lead, and mercury concentrations were less than residential RSLs. As shown on Figures 4-5, 4-6, and 4-7 PAH concentrations of several compounds were greater than residential RSLs but generally similar to or less than industrial RSLs. All PAH concentrations were less than corresponding maximum facility background concentrations. Ash was observed in one sample (at OU9-04) in a very thin layer; however, PAH concentrations were not greater than industrial RSLs in this sample.

TABLE 4-1

SUMMARY STATISTICS FOR SURFACE SOIL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

PARAMETER	MINIMUM DETECTED CONCENTRATION[1]	MAXIMUM DETECTED CONCENTRATION[1]	SAMPLE OF MAXIMUM DETECTED CONCENTRATION	FREQUENCY OF DETECTION[2]	RANGE OF DETECTED FACILITY BACKGROUND CONCENTRATIONS	MAXIMUM FACILITY BACKGROUND CONCENTRATION	USEPA RESIDENTIAL SCREENING LEVEL[3]	USEPA INDUSTRIAL SCREENING LEVEL [3]
INORGANICS (mg/kg)								
ANTIMONY	0.32 J	2.3 J	OU9-SS-24-0002	12/19	7 - 9.4	9.4	31	410
LEAD	18.8 J	6650 J	OU9-SS-12-0002-D	19/19	9.5 - 1100	**1100**	**400**	**800**
MERCURY	0.011	1.1	OU9-SS-18-0002	19/19	0.08 - 1.8	1.8	5.6	34
POLYCYCLIC AROMATIC HYDROCARBONS (ug/kg)								
2-METHYLNAPHTHALENE	5.9 J	140 J	OU9-SS-19-0002	7/10	44	**44**	310000	4100000
ACENAPHTHENE	4.7	530	OU9-SS-18-0002	15/19	ND	ND	3400000	33000000
ACENAPHTHYLENE	4.4	2100 J	OU9-SS-22-0002	16/19	74	**74**	3400000	33000000
ANTHRACENE	4.4	2400	OU9-SS-19-0002	17/19	ND	ND	17000000	170000000
BENZO(A)ANTHRACENE	10	7500 J	OU9-SS-22-0002	18/19	37 - 640	**640**	**150**	**2100**
BENZO(A)PYRENE	11	7400 J	OU9-SS-22-0002	18/19	36 - 1100	**1100**	**15**	**210**
BENZO(B)FLUORANTHENE	9.5 J	8500 J	OU9-SS-22-0002	18/19	41 - 1100	**1100**	**150**	**2100**
BENZO(G,H,I)PERYLENE	7.5	3600 J	OU9-SS-22-0002	18/19	39 - 410	**410**	1700000	17000000
BENZO(K)FLUORANTHENE	4.3	4800 J	OU9-SS-22-0002	18/19	38 - 1100	**1100**	**1500**	21000
CHRYSENE	11	8700 J	OU9-SS-22-0002	18/19	37 - 1600	**1600**	15000	210000
DIBENZO(A,H)ANTHRACENE	4.3	1600 J	OU9-SS-22-0002	16/19	180 - 190	**190**	**15**	**210**
FLUORANTHENE	3 J	11000 J	OU9-SS-22-0002	19/19	43 - 1700	**1700**	2300000	22000000
FLUORENE	8	1100	OU9-SS-19-0002	15/19	42	**42**	2300000	22000000
INDENO(1,2,3-CD)PYRENE	5.2	3500 J	OU9-SS-22-0002	18/19	38 - 440	**440**	**150**	**2100**
NAPHTHALENE	2.7 J	240 J	OU9-SS-19-0002	15/19	42 - 43	**43**	3600	18000
PHENANTHRENE	11	5500	OU9-SS-19-0002	18/19	40 - 470	**470**	1700000	17000000
PYRENE	2.2 J	9700 J	OU9-SS-22-0002	19/19	42 - 1400	**1400**	1700000	17000000

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.

2 - Sample and duplicated are counted as one sample when determining the frequency of detection.

3 - United States Environmental Protection Agency Regions 3, 6, and 9. (November 2010). Regional Screening Levels for Chemical Contaminants at Superfund Sites.
http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

Shading indicates that the maximum detected concentration exceeded the screening level or maximum facility background concentration.

Acronyms

J = Estimated

NA = Not Applicable

NC = No Criteria

ND = Non-Detect

USEPA = United States Environmental Protection Agency

TABLE 4-2

SUMMARY STATISTICS FOR SUBSURFACE SOIL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

PARAMETER	MINIMUM DETECTED CONCENTRATION[1]	MAXIMUM DETECTED CONCENTRATION[1]	SAMPLE OF MAXIMUM DETECTED CONCENTRATION	FREQUENCY OF DETECTION[2]	RANGE OF DETECTED FACILITY BACKGROUND CONCENTRATIONS	MAXIMUM FACILITY BACKGROUND CONCENTRATION	USEPA RESIDENTIAL SCREENING LEVEL[3]	USEPA INDUSTRIAL SCREENING LEVEL[3]
INORGANICS (mg/kg)								
ANTIMONY	0.22 J	3.7	OU9-SB-13-0406	16/38	7 - 9.4	9.4	31	410
LEAD	2.4 J	1180	OU9-SB-12-0204	38/38	9.5 - 1100	**1100**	**400**	**800**
MERCURY	0.0025 J	8.2	OU9-SB-22-0205	34/38	0.08 - 1.8	**1.8**	**5.6**	34
POLYCYCLIC AROMATIC HYDROCARBONS (ug/kg)								
2-METHYLNAPHTHALENE	16 J	560000 J	OU9-SB-22-0508	4/18	44	**44**	**310000**	4100000
ACENAPHTHENE	4.5 J	100000	OU9-SB-22-0508	18/38	ND	ND	3400000	33000000
ACENAPHTHYLENE	5.5 J	370000	OU9-SB-22-0508	24/38	74	**74**	3400000	33000000
ANTHRACENE	4.1	290000	OU9-SB-22-0508	25/38	ND	ND	17000000	170000000
BENZO(A)ANTHRACENE	3.1 J	410000 J	OU9-SB-22-0508	29/38	37 - 640	**640**	**150**	**2100**
BENZO(A)PYRENE	2.4 J	450000	OU9-SB-22-0508	29/38	36 - 1100	**1100**	**15**	**210**
BENZO(B)FLUORANTHENE	3.8	360000	OU9-SB-22-0508	30/38	41 - 1100	**1100**	**150**	**2100**
BENZO(G,H,I)PERYLENE	2.3 J	230000	OU9-SB-22-0508	30/38	39 - 410	**410**	1700000	17000000
BENZO(K)FLUORANTHENE	2.5 J	130000 J	OU9-SB-22-0508	28/38	38 - 1100	**1100**	**1500**	**21000**
CHRYSENE	3.5 J	420000	OU9-SB-22-0508	29/38	37 - 1600	**1600**	**15000**	**210000**
DIBENZO(A,H)ANTHRACENE	3.5 J	66000	OU9-SB-22-0508	24/38	180 - 190	**190**	**15**	**210**
FLUORANTHENE	3.1 J	550000	OU9-SB-22-0508	33/38	43 - 1700	**1700**	2300000	22000000
FLUORENE	2.5 J	320000	OU9-SB-22-0508	23/38	42	**42**	2300000	22000000
INDENO(1,2,3-CD)PYRENE	1.9 J	160000	OU9-SB-22-0508	27/38	38 - 440	**440**	**150**	**2100**
NAPHTHALENE	2.7 J	640000	OU9-SB-22-0508	23/38	42 - 43	**43**	**3600**	**18000**
PHENANTHRENE	3.5	1300000	OU9-SB-22-0508	33/38	40 - 470	**470**	1700000	17000000
PYRENE	2.9 J	910000 J	OU9-SB-22-0508	33/38	42 - 1400	**1400**	1700000	17000000

Footnotes:

1 - Sample and duplicate are considered as two separate samples when determining the minimum and maximum concentrations.

2 - Sample and duplicated are counted as one sample when determining the frequency of detection.

3 - United States Environmental Protection Agency Regions 3, 6, and 9. (November 2010). Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

Shading indicates that the maximum detected concentration exceeded the screening level or maximum facility background concentration.

Acronyms

J = Estimated

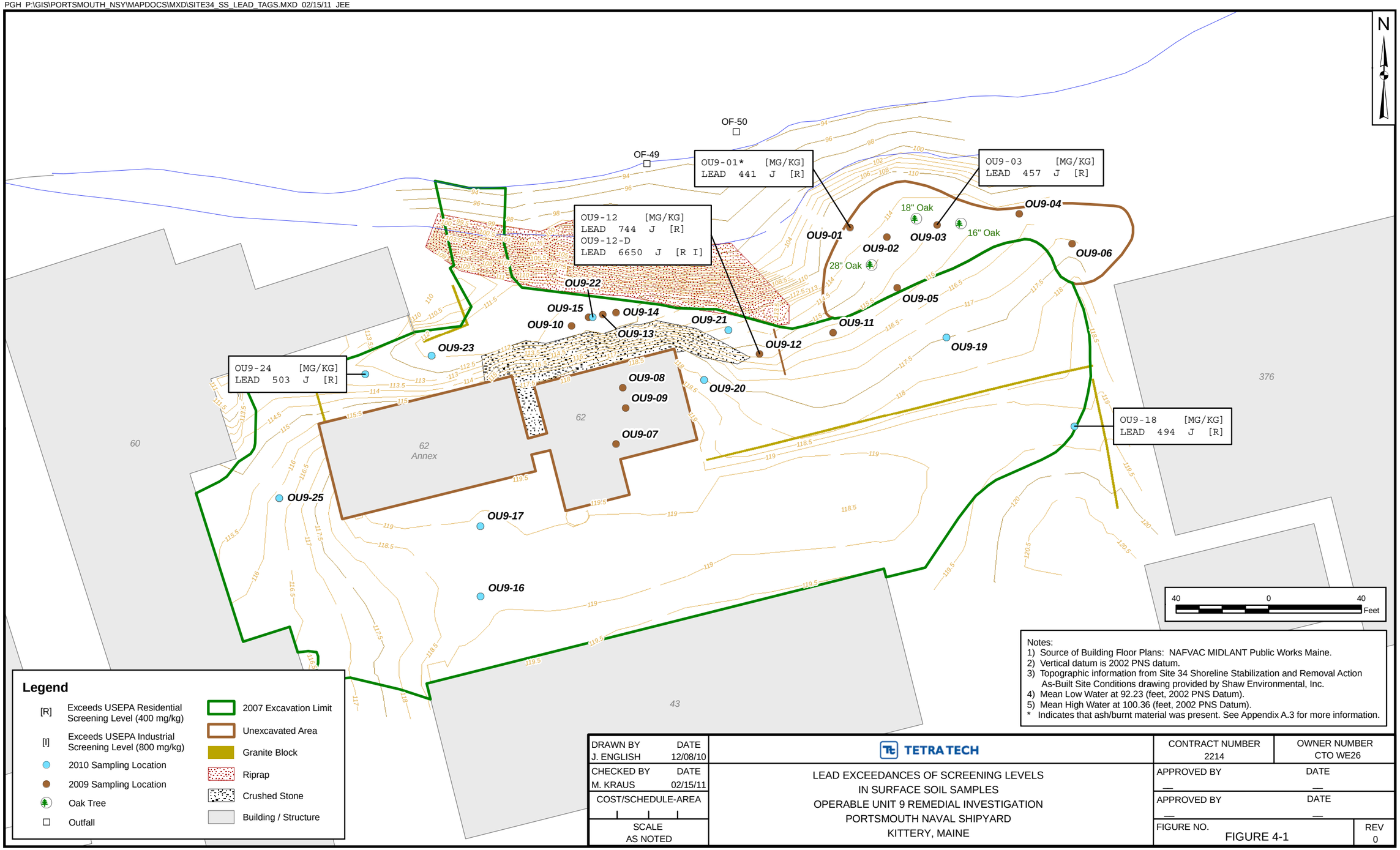
NA = Not Applicable

NC = No Criteria

ND = Non-Detect

USEPA = United States Environmental Protection Agency

PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SS_LEAD_TAGS.MXD 02/15/11 JEE



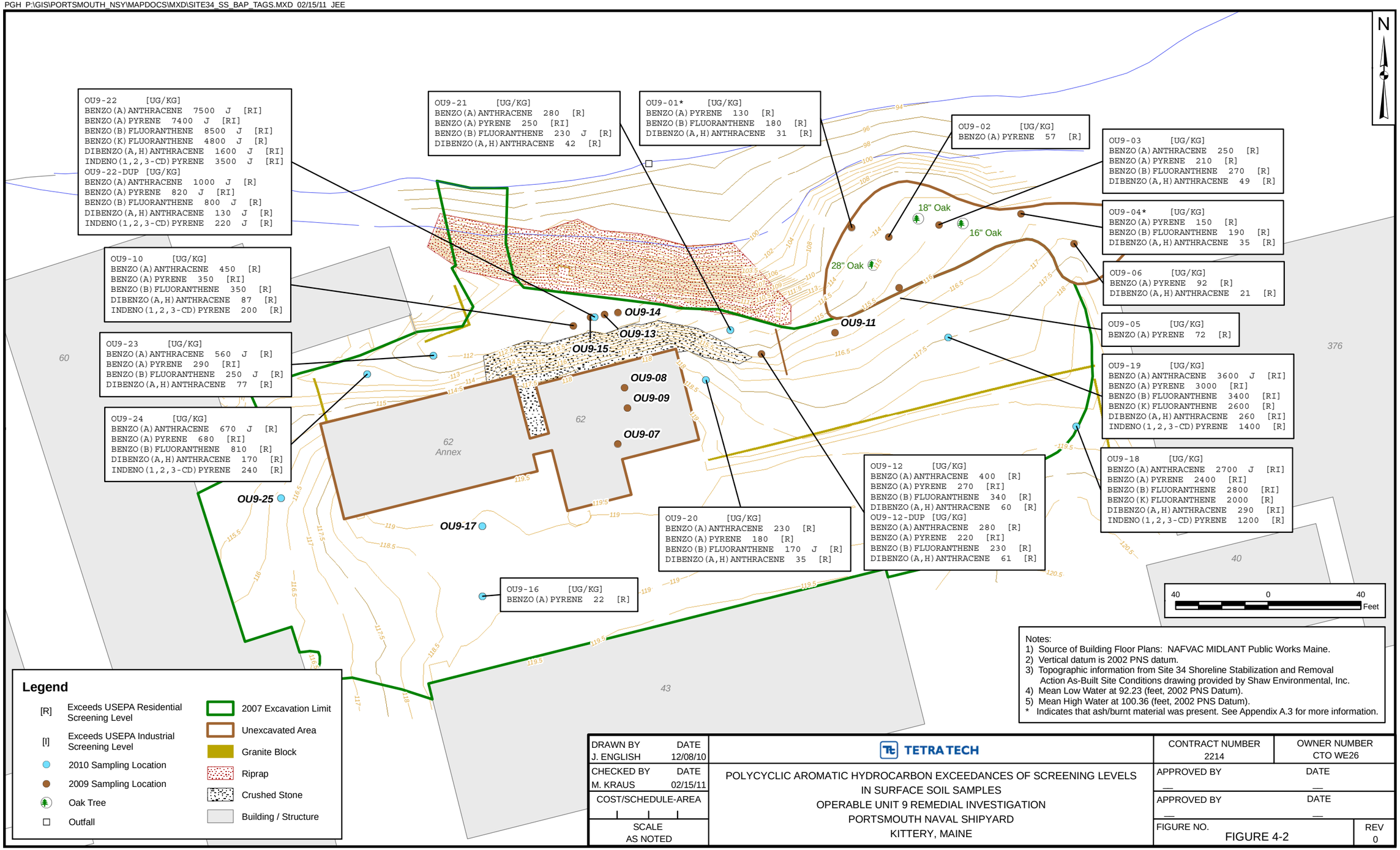
Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present. See Appendix A.3 for more information.

Legend

- [R] Exceeds USEPA Residential Screening Level (400 mg/kg)
- [I] Exceeds USEPA Industrial Screening Level (800 mg/kg)
- 2010 Sampling Location
- 2009 Sampling Location
- Oak Tree
- Outfall
- 2007 Excavation Limit
- Unexcavated Area
- Granite Block
- Riprap
- Crushed Stone
- Building / Structure

DRAWN BY J. ENGLISH	DATE 12/08/10	TETRA TECH	CONTRACT NUMBER 2214 / OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/15/11	LEAD EXCEEDANCES OF SCREENING LEVELS IN SURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 4-1 / REV 0

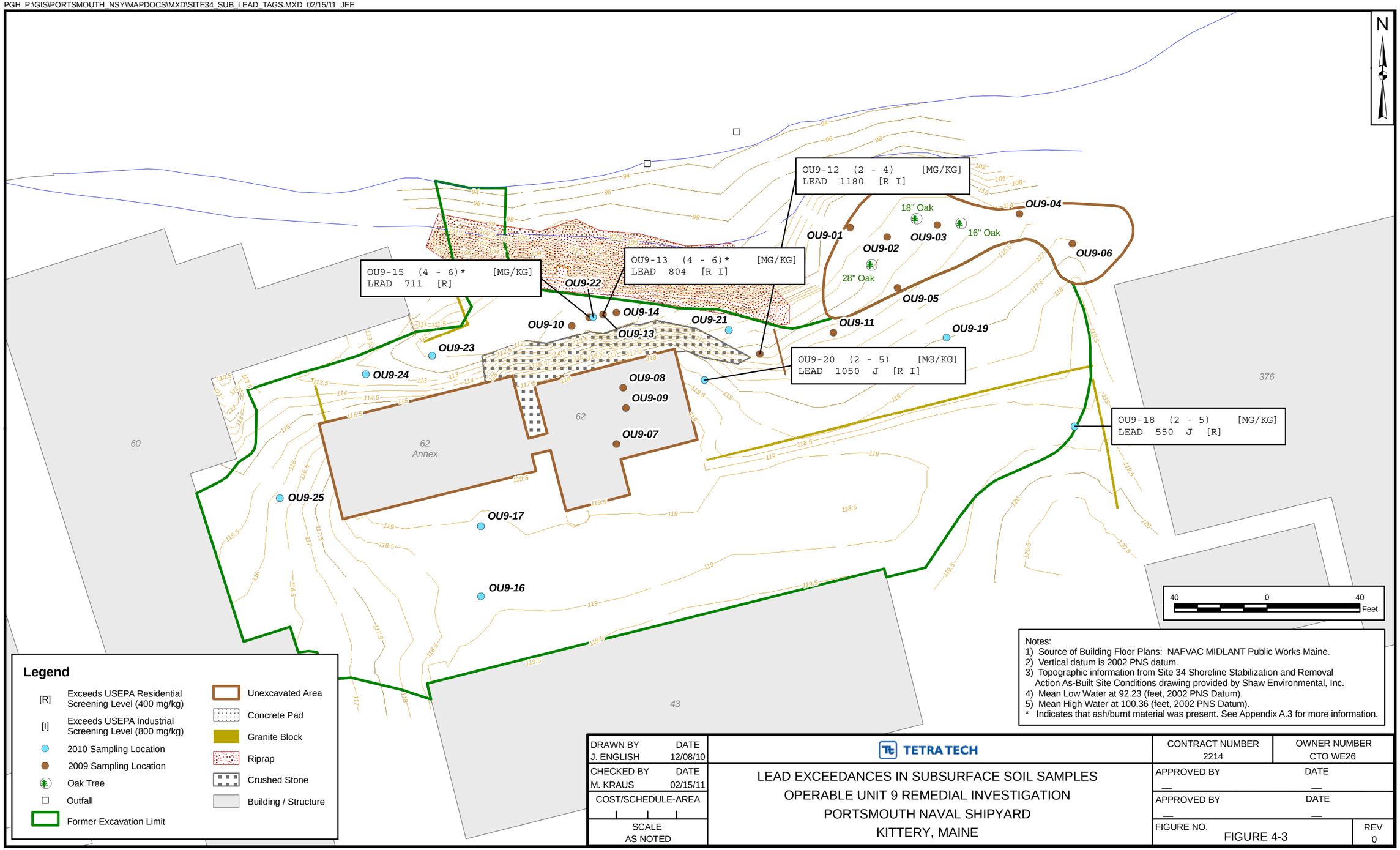
PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SS_BAP_TAGS.MXD 02/15/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present. See Appendix A.3 for more information.

DRAWN BY J. ENGLISH	DATE 12/08/10	TETRA TECH	CONTRACT NUMBER 2214 / OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/15/11	POLYCYCLIC AROMATIC HYDROCARBON EXCEEDANCES OF SCREENING LEVELS IN SURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 4-2 / REV 0

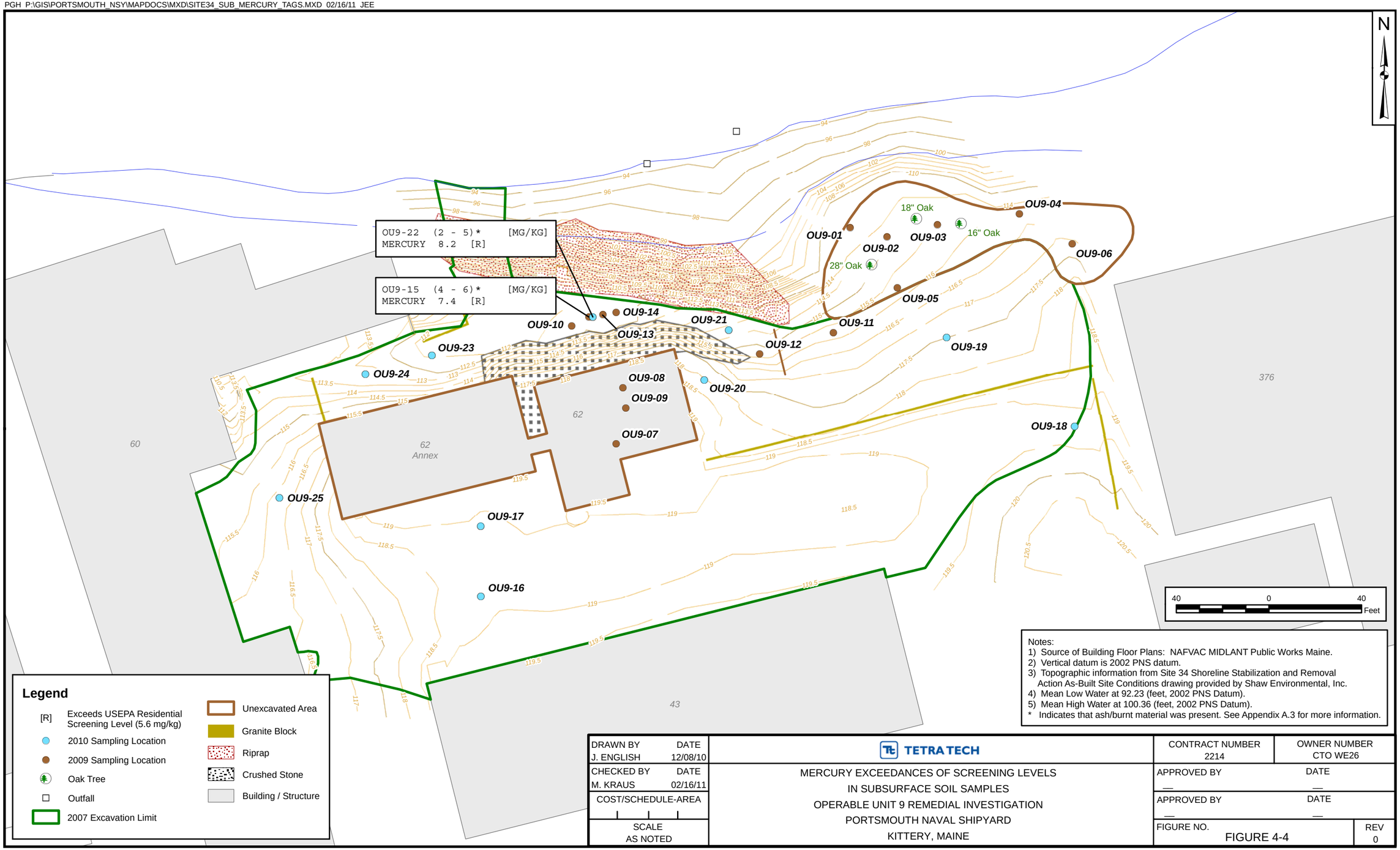
PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SUB_LEAD_TAGS.MXD 02/15/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present. See Appendix A.3 for more information.

DRAWN BY J. ENGLISH — DATE 12/08/10	TETRA TECH	CONTRACT NUMBER 2214	OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS — DATE 02/15/11	LEAD EXCEEDANCES IN SUBSURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — DATE —	
COST/SCHEDULE-AREA		APPROVED BY — DATE —	
SCALE AS NOTED		FIGURE NO. FIGURE 4-3	REV 0

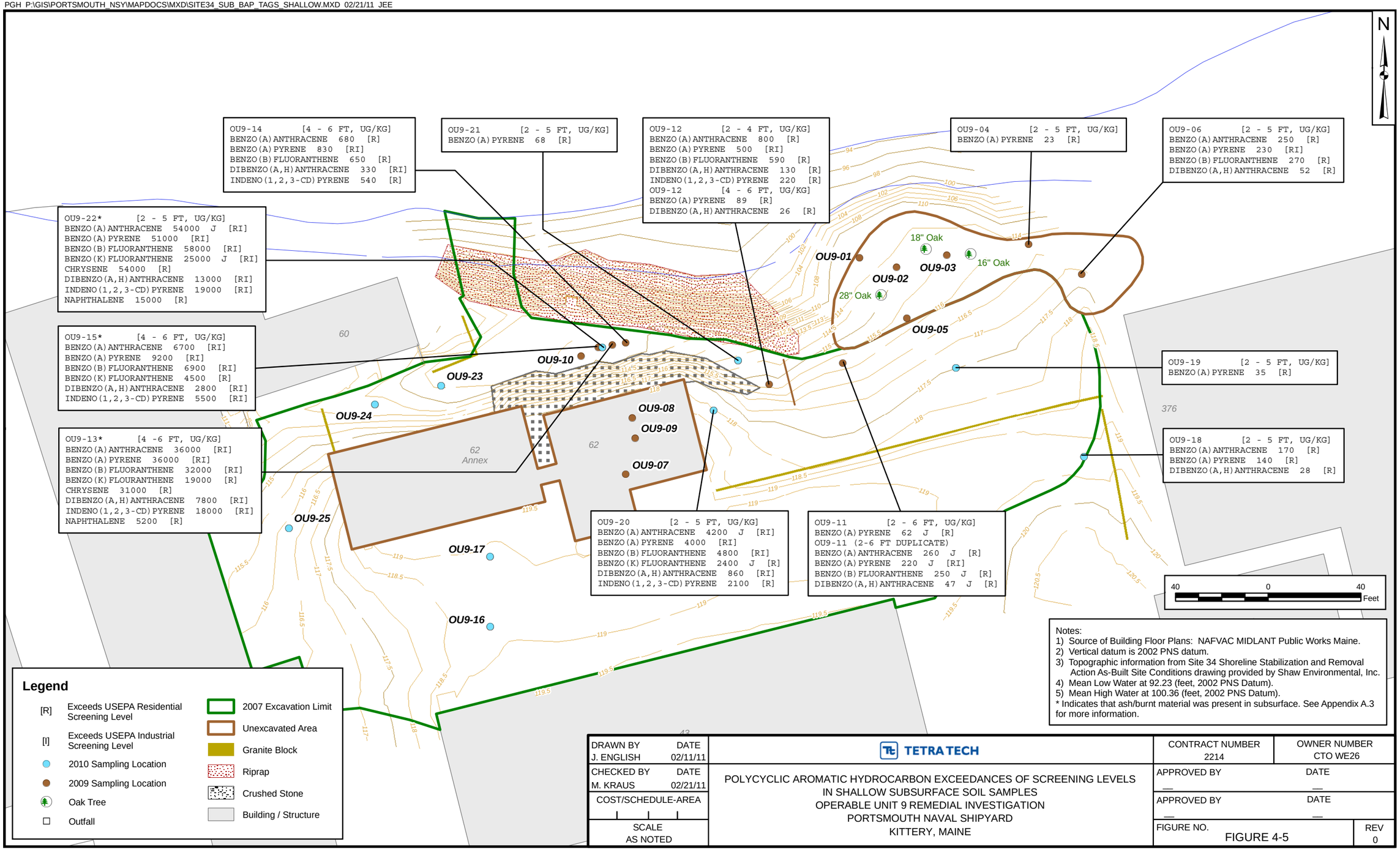
PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SUB_MERCURY_TAGS.MXD 02/16/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present. See Appendix A.3 for more information.

DRAWN BY J. ENGLISH	DATE 12/08/10	TETRA TECH	CONTRACT NUMBER 2214 / OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/16/11	MERCURY EXCEEDANCES OF SCREENING LEVELS IN SUBSURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 4-4 / REV 0

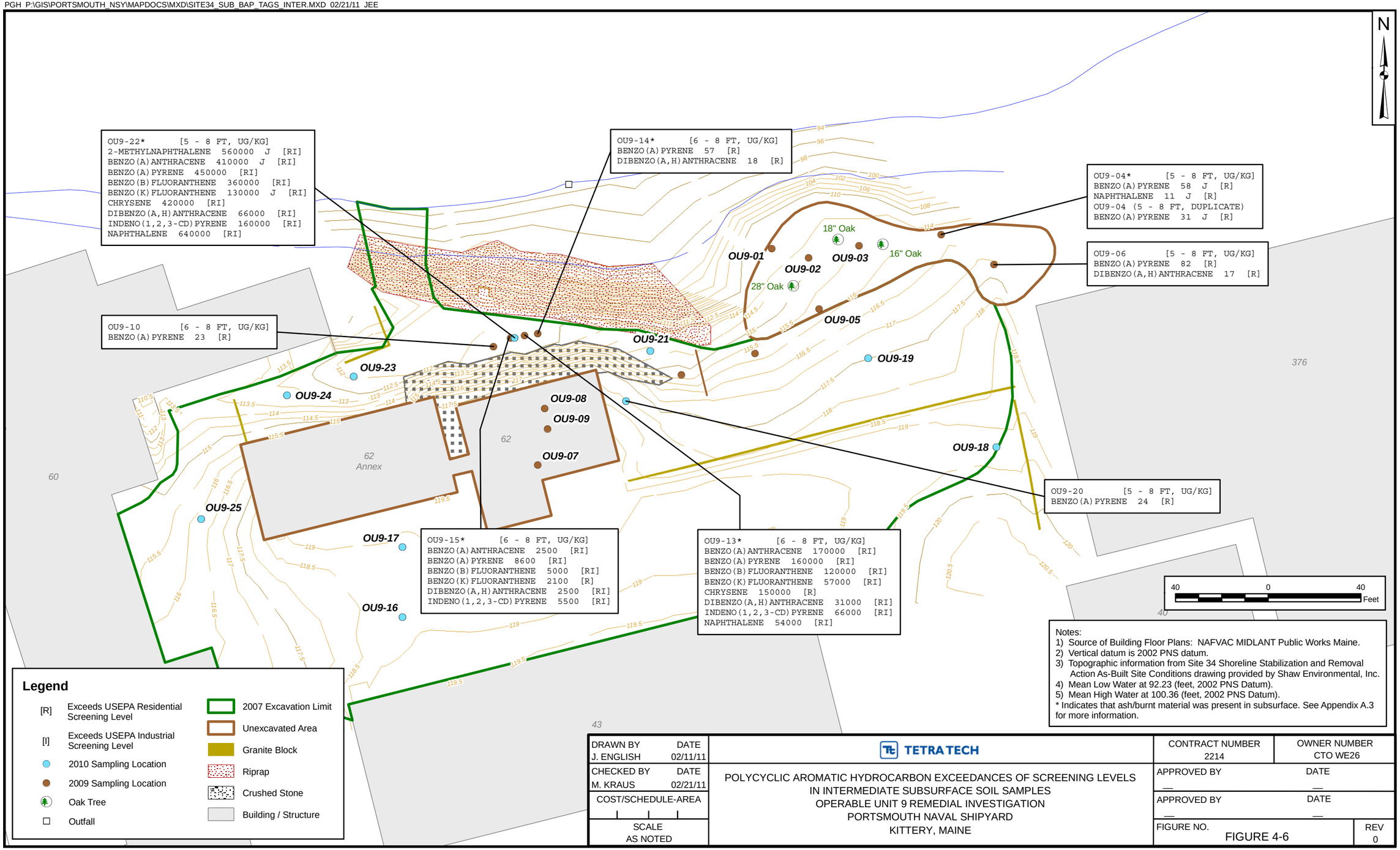
PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SUB_BAP_TAGS_SHALLOW.MXD 02/21/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present in subsurface. See Appendix A.3 for more information.

DRAWN BY J. ENGLISH DATE 02/11/11	TETRA TECH	CONTRACT NUMBER 2214	OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS DATE 02/21/11	POLYCYCLIC AROMATIC HYDROCARBON EXCEEDANCES OF SCREENING LEVELS IN SHALLOW SUBSURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — DATE —	
COST/SCHEDULE-AREA		APPROVED BY — DATE —	
SCALE AS NOTED		FIGURE NO. FIGURE 4-5	REV 0

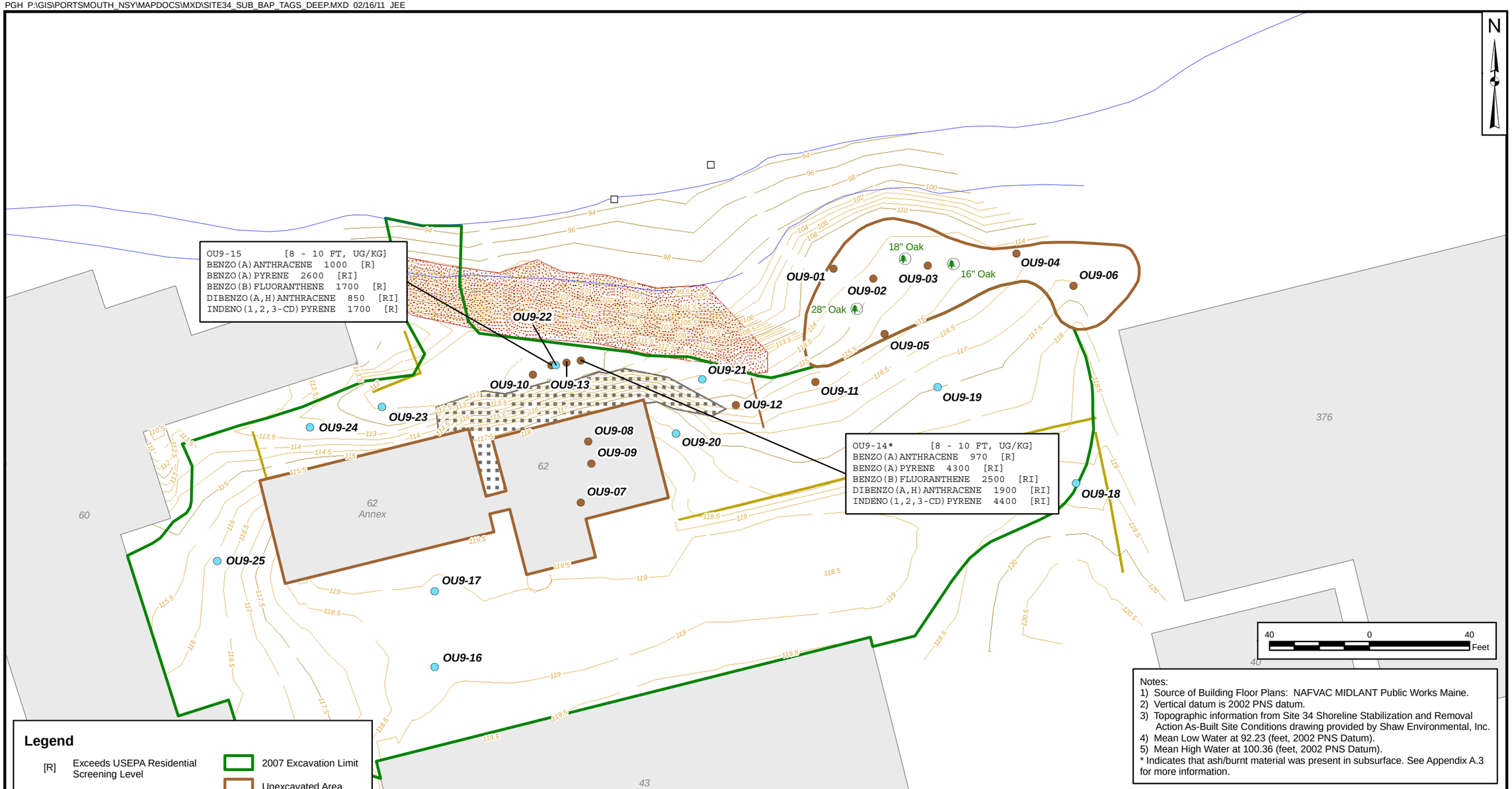
PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SUB_BAP_TAGS_INTER.MXD 02/21/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present in subsurface. See Appendix A.3 for more information.

DRAWN BY J. ENGLISH DATE 02/11/11	TETRA TECH	CONTRACT NUMBER 2214	OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS DATE 02/21/11	POLYCYCLIC AROMATIC HYDROCARBON EXCEEDANCES OF SCREENING LEVELS IN INTERMEDIATE SUBSURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — DATE —	
COST/SCHEDULE-AREA		APPROVED BY — DATE —	
SCALE AS NOTED		FIGURE NO. FIGURE 4-6	REV 0

PGH P:\GIS\PORTSMOUTH_NSY\MAPDOCS\MXD\SITE34_SUB_BAP_TAGS_DEEP.MXD 02/16/11 JEE



Notes:
1) Source of Building Floor Plans: NAFVAC MIDLANT Public Works Maine.
2) Vertical datum is 2002 PNS datum.
3) Topographic information from Site 34 Shoreline Stabilization and Removal Action As-Built Site Conditions drawing provided by Shaw Environmental, Inc.
4) Mean Low Water at 92.23 (feet, 2002 PNS Datum).
5) Mean High Water at 100.36 (feet, 2002 PNS Datum).
* Indicates that ash/burnt material was present in subsurface. See Appendix A.3 for more information.

Legend

[R]	Exceeds USEPA Residential Screening Level
[I]	Exceeds USEPA Industrial Screening Level
	2010 Sampling Location
	2009 Sampling Location
	Oak Tree
	Outfall
	2007 Excavation Limit
	Unexcavated Area
	Granite Block
	Riprap
	Crushed Stone
	Building / Structure

DRAWN BY J. ENGLISH	DATE 02/11/11	TETRA TECH	CONTRACT NUMBER 2214 / OWNER NUMBER CTO WE26
CHECKED BY M. KRAUS	DATE 02/16/11	POLYCYCLIC AROMATIC HYDROCARBON EXCEEDANCES OF SCREENING LEVELS IN DEEP SUBSURFACE SOIL SAMPLES OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	APPROVED BY — / DATE —
COST/SCHEDULE-AREA			APPROVED BY — / DATE —
SCALE AS NOTED			FIGURE NO. FIGURE 4-7 / REV 0

5.0 CONTAMINANT FATE AND TRANSPORT ANALYSIS

This section discusses the evaluation of contaminant fate and transport at OU9 to provide an understanding of potential risks from future contaminant migration to the offshore area. To support the evaluation, a discussion of the physical and chemical properties of the contaminants associated with OU9 sources and their potential persistence, migration, dispersion, and degradation pathways and the CSM of contaminant migration are provided.

5.1 PHYSICAL AND CHEMICAL PROPERTIES

The persistence of various classes of contaminants and their chemical and physical properties in soil-water environments are discussed in this section. Several chemical transformation mechanisms affect contaminant persistence, including hydrolysis, biodegradation, photolysis, and oxidation/reduction reactions. As discussed in Section 4.0, COPCs for OU9 are PAHs, antimony, lead, and mercury.

5.1.1 Polycyclic Aromatic Hydrocarbons

PAHs are generally considered to be fairly immobile chemicals in the environment. PAHs are large molecules with low solubilities, vapor pressures, and Henry's Law constants, and have high partitioning coefficients. The low molecular weight PAHs (e.g., acenaphthene, anthracene, fluorene, and phenanthrene) may volatilize from surface waters, whereas the higher molecular weight PAHs (e.g., benzo(a)pyrene, benzo(a)anthracene, chrysene, etc.) are less likely to volatilize. PAHs in soil are much more likely to bind to soil and be transported via mass transport mechanisms than through dissolution. These compounds, when found in the surface soil, generally do not migrate vertically to a great extent. Instead, they are more likely to adhere to soil particles and be removed from the site via surface water runoff and erosional processes, especially when no pavement is present or if erosion controls are not present or functioning properly.

Bio-concentration of PAHs in aquatic organisms is greater for the higher molecular weight compounds than the lower molecular weight compounds. PAHs can be bioaccumulated from water, sediments, or organisms lower in the food chain. Bioaccumulation from water through biological membranes requires the chemical in the surrounding water to be available in a dissolved form. Environmental factors that reduce the amount of a chemical in true solution will also reduce the rate of uptake of the chemical. Among the most important processes that reduce bioavailability are adsorption to suspended solids, adsorption to sediments, adsorption to humic acids and other macromolecules, formation of colloidal suspensions, chelation, complexation, and ionization. Some of the bound chemicals may be available to benthic organisms through ingestion or direct uptake from pore water (Rand and Petrocelli, 1985).

PAHs are highly amenable to microbial degradation in soil and sediment. The rate of degradation is influenced by temperature, pH, oxygen concentration, initial chemical concentration, and moisture. Photolysis, hydrolysis, and oxidation are not important fate processes for the degradation of PAHs in soil (ATSDR, October 1989). The most important fate processes for PAHs in water are photo-oxidation, chemical oxidation, and biodegradation. PAHs do not contain functional groups that are susceptible to hydrolytic reactions, and hydrolysis is considered an insignificant degradation mechanism. The rate of photodegradation is influenced by water depth, turbidity, and temperature. Benzo(a)pyrene, chrysene, fluorene, and pyrene are reported to be resistant to photodegradation. PAHs may also be oxidized by chlorination and ozonation, and they may be metabolized by microbes under oxygenated conditions (ATSDR, October 1989).

The mobility of PAHs via the groundwater pathway at OU9 is not considered significant because no overburden groundwater is present at the site. At OU9 PAHs are expected to be bound to site soils and therefore immobile and not a concern for migration under current site conditions.

5.1.2 Lead

Industrial operations (i.e. oil gasification and blacksmithing) resulting in the generation of coal ash could have contributed to the concentrations of lead in soil at the site.

The following summarizes the chemical behavior of lead in the environment (ATSDR, August 2007):

- Metallic lead or lead compounds can migrate into groundwater under highly acidic conditions at the source.

- Lead forms several compounds, above a pH of 5.4, with naturally occurring anions in water (hydroxides, carbonates, phosphates, etc.) that are relatively insoluble compounds that precipitate out of the aqueous phase. This limits the solubility of lead and thereby its mobility in the environment.

- In the presence of natural organic matter in the pH range of 6 to 8, lead is strongly bound to soil by the formation of organic complexes.

- Even low levels of carbonate ions formed from the dissolution of atmospheric carbon dioxide are sufficient to maintain lead concentrations a level less than 500 µg/L because of the formation of lead carbonates under alkaline conditions.

- In seawater, lead complexes and coprecipitates formed with naturally occurring iron-manganese oxides aid in removing lead from solution.

As provided in Section 5.1.1, mobility via the groundwater pathway is not significant; therefore, the primary matrix of concern at OU9 is soil. Disposal sample analytical results from the 2007 removal action had soil pH results of 7.3 and 7.4 (Shaw, July 2008). As described above lead is strongly bound to soil by the formation of organic complexes in the pH range of 6 to 8; therefore, it is anticipated that lead in OU9 soils is strongly bound to site soils and thereby highly immobile.

5.1.3 Antimony

Antimony, which is a metalloid exhibiting several valence states is one of the constituents of coal ash. Antimony is likely to remain in a relatively immobile form in soil because of its tendency to form coprecipitates with naturally occurring hydrous iron, manganese, and aluminum oxides in soil. Under neutral to slightly alkaline conditions, these coprecipitates should remain stable entrapment mechanisms for antimony. Detections of antimony in soil at OU9 were low (less than residential RSLs) and data indicate that site soils are neutral; therefore, antimony is not of concern for migration at OU9.

5.1.4 Mercury

Mercury is found in the environment in metallic form and as inorganic and organic complexes it is also present in fossil fuels and therefore is likely to be present at elevated levels in industrial areas. Mercury is more volatile than most heavy metals and therefore it can partition to and undergo vapor-phase transport. It also undergoes several interrelated transformations between gas, aqueous, and solid phases in the environment. Inorganic mercury sorbed to particulate matter is not readily desorbed, and leaching is a relatively insignificant transport process in soil (ATSDR, March 1999). Concentrations of mercury were low (less than residential RSLs) except for two subsurface soil locations; therefore, mercury is not of concern for migration.

5.2 CONCEPTUAL SITE MODEL OF CONTAMINANT MIGRATION

The CSM for OU9 was developed based on site history and uses, site characterization (e.g. geology and hydrogeology information), and site contaminant fate and transport pathways and processes.

The primary source of contamination at OU9 is from ash in the former ash pile to the north of Building 62 and ash under asphalt and grass around Building 62. Ash is the primary source of PAH and metals contamination. Contaminants released from the fill can migrate via several pathways as discussed, in Section 5.2.1. Potential exposure routes and receptors are discussed in Section 5.2.2.

5.2.1 Potential Contaminant Migration Pathways

Figure 5-1 illustrates the potential migration pathways of contaminants from the onshore to the offshore environment. Contaminant migration includes migration from the onshore environment to the offshore environment. Migration within the offshore environment (if migration from the onshore environment to the offshore environment occurs), would be addressed as a part of OU4.

Before the 2007 removal action, the contaminant migration mechanism at OU9 was surface erosion of ash exposed to precipitation or wind followed by transport of the eroded material in drainage paths leading to offshore sediments (surface water runoff). Erosion and overland runoff are potential future migration mechanisms if areas where ash was not excavated are disturbed and ash is exposed. In the grassy area where ash was not excavated, erosion along the shoreline and transport to the offshore is not a significant migration pathway because there is a stable bedrock ledge along the shoreline in this area that prevents erosion of ash along the shoreline. Erosion, overland runoff, and migration of the ash via wind are prevented by the layer of grass and soil covering the ash.

Before the 2007 removal action, some surface ash on the steep bank between Building 62 and the Piscataqua River at the high-tide elevation may have eroded as a result of tidal action in the report. Tidal action does not affect the onshore area of OU9. As part of the 2007 removal action, most of the ash on site and on the steep bank was excavated, the area was backfilled, and the area with the steepest slope was covered with riprap. Only small pockets of ash remain on site from mainly at 2 to 5 feet bgs which would not be subject to tidal influences or contact with groundwater.

5.2.2 Potential Exposure Routes and Receptors

Potential exposure routes include direct contact with the surface soil and subsurface soil. Potential receptors for these exposure routes include current/future construction workers, potential future recreational user exposure, potential future occupational worker exposure, and hypothetical future residential exposure.

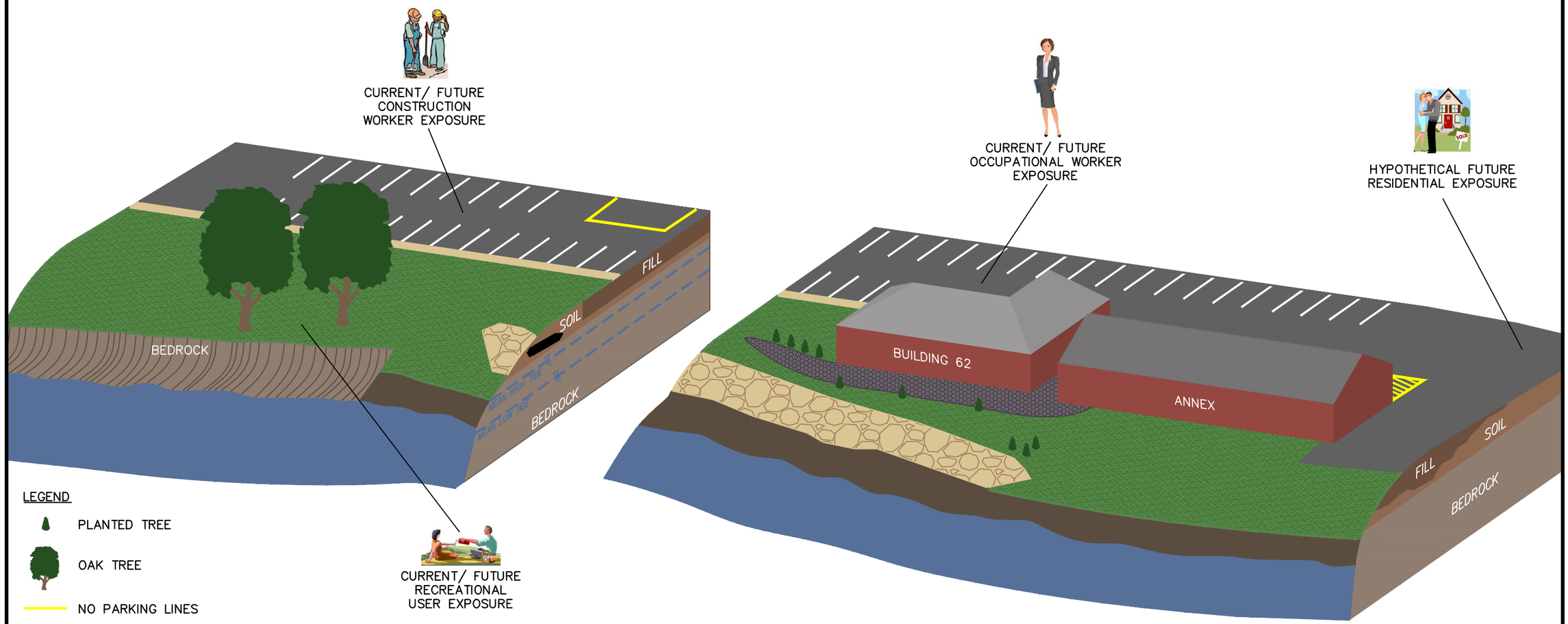
Potential current onshore human exposure pathways for surface and subsurface soil are likely for construction workers digging into the soil. Occupational workers who visit the site daily for routine office work or similar activities are not likely to be exposed to soil at OU9 under current conditions, because contaminated soils are covered by topsoil, buildings, or paved areas. There is a small, relatively flat, grassy area with trees where people could recreate. Recreational users are not likely to be exposed to soil in this area under current conditions because soil is covered with grass and trees. Future occupational and recreational exposure to surface soil is possible if the asphalt or grass cover is removed

or not maintained. Residential use of the site is not likely as long as the Shipyard is in operation; however, hypothetical future residential use is evaluated as a risk scenario that could occur if the Shipyard closed or if the site was developed for other uses. The industrialized nature of the site minimizes exposure of any onshore ecological receptors to site soil.

5.3 CONTAMINANT FATE AND TRANSPORT SUMMARY

The site surface is mostly covered with asphalt/pavement or buildings limiting mobilization of contaminants through surface water runoff or infiltration of precipitation. Subsurface soil migration off of the slope in the northern section of the OU9 is restricted by subsurface geotextile fabric and riprap put in place during the 2007 removal action. No overburden groundwater is present at OU9 and all contamination is above overburden material; therefore, subsurface soil does not contact groundwater. Only a small portion of OU9 is covered with flora so exposure from herbivore feeding on the vegetation is not a concern.

The fate and transport of PAHs and inorganic contaminates (i.e., lead and mercury) are controlled at OU9 mainly by the mobility of soil particles. PAHs are generally considered to be fairly immobile but persistent chemicals in the environment that generally do not migrate vertically to a great extent in soil and site data indicate that is the case at OU9. Instead, they are more likely to adhere to soil particles and be removed from the site via surface water runoff and erosional processes, especially when no pavement is present or if erosion controls are not present or functioning properly. Metals do not undergo any of the degradation reactions that most organic chemicals do; therefore, metals are considered to be persistent. The major fate mechanisms for metals are adsorption to the soil matrix and bioaccumulation. The major transport mechanisms of OU9 contaminants are soil erosion and surface water runoff; however, because most of the site contamination was removed, offsite migration of remaining contamination in the subsurface is not expected under current or future site conditions. Subsurface soil contamination being brought to the surface in the future is unlikely because the majority of that contamination is near a main water line located near a steep slope adjacent to the coast. However, in the unlikely event that subsurface soil contamination was brought to the surface in the future, significant contaminant migration would not occur due to the minimal volume of contamination remaining on site.



LEGEND

- PLANTED TREE
- OAK TREE
- NO PARKING LINES
- PISCATAQUA RIVER
- GRASS
- PARKING LOT
- RIPRAP
- CRUSHED STONE
- POCKET OF ASH/ BURNT MATERIAL

FILL – 2007 FILL (PLACED AS PART OF REMOVAL ACTION)

SOIL – EXISTING SOIL PRE–2000 INCLUDES NATIVE AND REWORKED SOIL

NOTE:

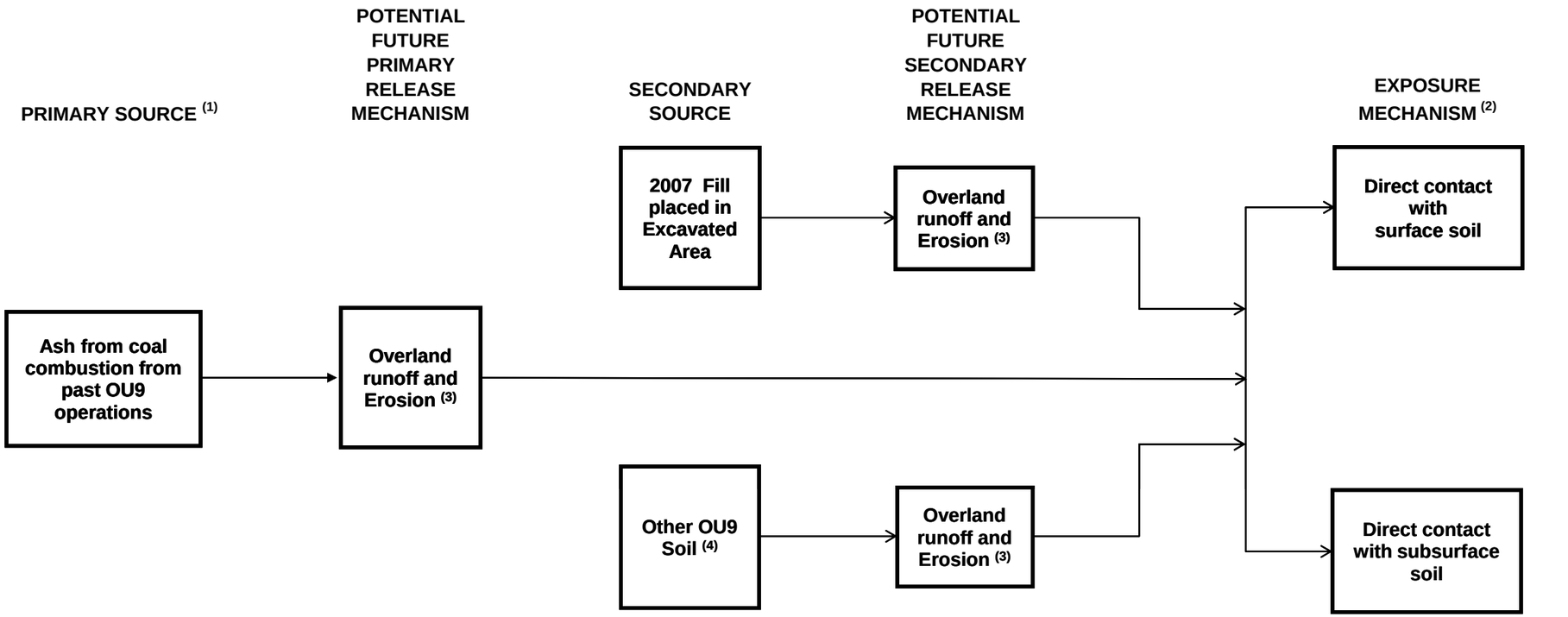
1. APPROXIMATELY 5% OF THE SUBSURFACE MATERIAL MAYBE RESIDUAL ASH/ BURNT MATERIAL BASED ON CONSERVATIVE ESTIMATES THAT USED BORING LOG INFORMATION.
2. SOIL IS COVERED WITH ASPHALT, GRASS, OR RIPRAP. SOIL WOULD NEED TO BE EXPOSED FOR OCCUPATIONAL WORKER OR RECREATIONAL USER EXPOSURE.

DRAWN BY CK	DATE 02/18/10	CONCEPTUAL SITE MODEL OPERABLE UNIT 9 REMEDIAL INVESTIGATION PORTSMOUTH NAVAL SHIPYARD KITTERY, MAINE	CONTRACT NO. 2214
CHECKED BY MK	DATE 02/18/10		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NOT TO SCALE			DRAWING NO. FIGURE 5–1 / REV. 0

NAVFAC

R:\1456 – Portsmouth Naval Shipyard\CSM\1456CSM01.dwg PIT NICHOLE.DILLA 2/8/2011 12:23:09 PM

FIGURE 5-2
CONCEPTUAL SITE MODEL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE



■ = COMPLETE EXPOSURE PATHWAY

POTENTIAL ONSHORE HUMAN HEALTH RECEPTORS / EXPOSURE ROUTE	Current/Future Construction Worker	Current/Future Occupational Worker	Current/Future Recreational User	Future Hypothetical Resident
Direct contact	■	■	■	■
Ingestion	■	■	■	■
Inhalation	■	■	■	■

Direct contact	■			
Ingestion (incidental)	■			
Inhalation	■			

Footnote:

1. Ash was removed from the majority of the site during the 2007 removal action.
2. Exposure to surface water or sediment for human health is considered to be an incomplete pathway because there is no public access to the offshore from the site. The shoreline is rocky and very steep and consequently, typical recreational activities would not be possible. Sediment contamination from past OU9 releases are being addressed under OU4.
3. Currently, any ash remaining onsite is covered with asphalt, grass, or riprap. For the release mechanism to occur ash would need to be exposed.
4. Other OU9 soil refers to any soil present onsite other than the fill placed in the excavation area during the 2007 removal action including soil underneath Building 62 Annex which was built after Building 62 operations ended. It is not known if ash is present under Building 62 Annex; however, a complete exposure pathway to the soil under Buidling 62 Annex is only possible if that building is demolished.

6.0 HUMAN HEALTH RISK ASSESSMENT

The HHRA summarized in this section was performed to characterize and quantify potential risks to select receptors at OU9 based on current and future land use scenarios. OU9 consists of the onshore area where surface and subsurface soil samples were collected. Potential receptors at OU9 were identified as current/future construction workers, recreational users (child and adult), and occupational workers, and hypothetical future residents (child and adult).

Figures 5-1 and 5-2 show the CSMs developed for OU9 and the HHRA. The CSMs indicate the receptors and potential pathways by which exposure could occur at OU9. All receptors were evaluated for exposure to surface soil, which was defined as 0 to 2 feet bgs in accordance with other assessments at performed PNS. Construction workers were also evaluated for exposure subsurface soil. Occupational worker, recreational, and residential exposures to subsurface soil are evaluated quantitatively and presented in the Uncertainty Analysis (Section 6.6) to facilitate risk management decisions because contact with subsurface soil for these receptors is not anticipated. No receptors were evaluated for groundwater ingestion because no overburden groundwater is present at OU9.

6.1 RISK ASSESSMENT PROCEDURES

Three major aspects of contaminant exposure must be considered to assess potential public health risks: (1) contaminants with toxic characteristics must be identified in environmental media and be released by either natural processes or human action; (2) pathways by which actual or potential exposure occurs must be present; and (3) human receptors must be present at the point of exposure to complete the exposure route. Risk is a function of both toxicity and exposure; without one of the factors listed above, there is no risk.

The HHRA for OU9 consists of four major components:

- Data evaluation
- Exposure assessment
- Toxicity assessment
- Risk characterization (including uncertainty analysis)

Data evaluation is primarily concerned with data usability and the selection of COPCs, which are those contaminants that pose the greatest potential for causing adverse human health effects. A discussion of data usability is provided in Section 6.2.1. Methods for the selection of COPCs are described further in Section 6.2.2, and COPC selection tables are presented in Appendix C.1.

Exposure assessment is the process of identifying potential receptor populations and exposure pathways by which receptors may come in contact with contaminants at the site. Potential exposure routes under current and future land uses are developed from information gathered about the source area, contaminant concentrations, contaminant release mechanisms, patterns of human activity, and other pertinent information. The exposure assessment includes the methodologies used to calculate quantitative estimates of contaminant intake for each identified receptor, pathway, and route of exposure under the reasonable maximum exposure (RME) and central tendency exposure (CTE) scenarios. Relevant exposure input parameters and equations used to estimate contaminant intakes are presented in Appendix C.1. The OU9 exposure assessment is discussed further in Section 6.3 and Appendix C.2.

The toxicity assessment presents the contaminant-specific toxicity criteria for all identified COPCs at OU9. Toxicity criteria provide the basis for quantifying potential human health risks when integrated with the estimated intakes developed in the exposure assessments. Toxicity assessment is further detailed in Section 6.4.

Risk characterization methodologies used to characterize risks associated with non-carcinogenic and carcinogenic effects to select receptors from exposure to COPCs are provided in Section 6.5. Various uncertainties are associated with risk characterization because the quantitative risk estimates developed are based on a number of assumptions (concerning exposure, land use, toxicity, etc.). An uncertainty analysis is provided in Section 6.6 and reviews general uncertainties associated with the HHRA for OU9.

The HHRA for OU9 was conducted with reference to current Navy, USEPA, and State of Maine HHRA guidelines including:

- Navy, December 2008. U.S. Navy HHRA Guidance.

- State of Maine Department of Environmental Protection and Center for Disease Control, July 2009. Guidance for HHRAs for Hazardous Substance Sites in Maine. DEP-BRWM 2B 2009.

- USEPA, December 1989. Risk Assessment Guidance for Superfund (RAGS) - Volume I - Human Health Evaluation Manual (Part A) - Interim Final. EPA/540/1-89/002. Office of Emergency and Remedial Response.

- USEPA, March 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Office of Solid Waste and Emergency Response (OSWER), Washington, D.C. Directive 9285.6 03.

- USEPA, February 1992. Guidance on Risk Characterization for Risk Managers and Risk Assessors. Office of the Administrator, Washington, DC.

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

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

- USEPA, July 1994. Revised Interim Guidance on Establishing Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive 9355.4-12.

- USEPA, August 1997. Exposure Factors Handbook. EPA/600/8-89/043. Office of Health and Environmental Assessment, Exposure Assessment Group. Washington, D.C.

- USEPA, April 1999. Use of the Technical Review Workgroup (TRW) Interim Adult Lead Methodology in Risk Assessment. Memorandum from Pat Van Leewven and Paul White to Mark Maddaloni.

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

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

- USEPA, May 2002. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows 32-bit version. [EPA 9285.7-42].

- USEPA, January 2003. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. USEPA. Washington, DC. EPA-540-R-03-001. [URL: http://www.epa.gov/superfund/programs/lead/adult.htm].

- USEPA, November 2003. Assessing Intermittent or Variable Exposures at Lead Sites. OSWER, Washington, D.C. EPA-540-R03-008, OSWER #9285.7-76.

- USEPA, July 2004. 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. EPA/540/R/99/005.

- USEPA, March 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum, Washington, DC.

- USEPA, March 2005b. Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum, Washington, DC. March.

- USEPA, 2009. Soil Screening Guidance, USEPA website: http://rais.ornl.gov/epa/ssl1.shtml - Accessed August 2009.

- USEPA, January 2009. 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. 20460 EPA-540-R-070-002, OSWER 9285.7-82.

- USEPA, June 2009. Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Baseline Geometric Standard Deviation Parameters. Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA-540-R-070-002, OSWER 9200.2-82.

- USEPA, February 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwin v 1.1 Build 11).

- USEPA, May 2010a. ProUCL Version 4.1.00 Draft User Guide. Office of Research and Development, Washington, D.C. EPA/600/R-07/038.

- USEPA, May 2010b. USEPA TRW for Lead. Guidance Document. Frequently Asked Question (FAQs) on the Adult Lead Model. May 10. http://www.epa.gov/superfund/lead/almfaq.htm.

- USEPA, November 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites, http://epa-prgs.ornl.gov/chemicals/index.shtml.

- USEPA, December 2010. Integrated Risk Information System, On-Line Data Base. Environmental Criteria and Assessment Office, Cincinnati, OH. http://www.epa.gov/iris/index.html.

Deviations from the OU9 RI SAP (Work Plan) are noted in Section 6.6.5.

Analytical data for soil used in the HHRA for OU9 are expected to adequately characterize potential risks for direct and inadvertent exposure to site contamination. The list of COPCs was determined by following the COPC selection presented on RAGS tables 2.1 and 2.2 presented in Appendix C.1.

6.2 DATA EVALUATION

A site-specific data evaluation was performed to determine which of the detected contaminants at the site are most likely to present a risk to potential human receptors. The end result of this quantitative selection process is a list of COPCs. Section 6.2.1 provides a summary of data usability for OU9 as it pertains to the HHRA. The selection process used to identify COPCs is described in Section 6.2.2.

6.2.1 Data Usability

Data qualified during the data validation process are not expected to compromise the results of the HHRA. Analytical data qualified as rejected ("R") would not be used for risk assessment evaluations; however, no data evaluated for use in this risk assessment were qualified as rejected. Analytical data qualified as estimated ("J") were used for the OU9 HHRA. The use of estimated data adds to the uncertainty associated with the risk assessment; however, the associated uncertainty is expected to be negligible compared with the other uncertainties inherent in the risk evaluation process (e.g., uncertainties with land uses, exposure scenarios, toxicological criteria, etc.). When determining exposure concentrations via statistical procedures, the sample detection limit was used as a surrogate concentration for non-detected results (qualified "U"), as described in Section 6.3.4.

For the purposes of this risk assessment, overall data quality is sufficient. The most notable anomalies were low matrix spike recoveries indicating that antimony data qualified due to matrix spike contamination are biased low and one unusually high concentration of lead detected in surface soil at location OU9-12.

Estimated soil antimony risks may be biased low by approximately 70 percent as indicated by low matrix spike recoveries detected during data validation. However, antimony soil concentrations detected were low compared to the USEPA residential RSL for antimony of 31 mg/kg. The maximum detected

concentration of antimony at OU9 was 2.3 mg/kg. Increasing that concentration by 70 percent results in a concentration of 3.9 mg/kg which is still an order of magnitude less than the USEPA residential RSL for antimony. Even though matrix spike QC samples indicated that antimony results are biased low the site soil concentrations of antimony are so low that antimony would not present unacceptable site risks.

A field duplicate sample was collected for sample OU9-SS-12-0002 during the 2009 sampling event and analyzed for PAHs, antimony, lead, and mercury. The duplicate sample yielded an unusually high lead concentration of 6,650 mg/kg, which was qualified as estimated during data validation due to field duplicate imprecision. The other sample collected at OU9-12 yielded a lead result of 744 mg/kg, which is within the range of concentrations generally detected in soils at OU9. Due to the unusually high lead concentration of 6,650 mg/kg detected in the duplicate surface soil sample at OU9-SS-12-0002 and a change in the original CSM (i.e., ash was found in the excavated area where it was not expected) a second round of data was collected in 2010 to determine if the high detection of lead was characteristic of site conditions or an anomaly. The additional data collected in 2010 indicate that the high lead concentration detected in the duplicate sample at OU9-SS-12-0002 in 2009 was an anomaly. A plot of all lead surface soil concentrations is provided in Appendix B (Background Comparisons).

Analytical results for 2-methylnaphthalene in soil are provided for the 2010 samples only because the laboratory analyzed 2010 soil samples for 2-methylnaphthalene even though that compound was not requested for analysis. In accordance with the OU9 RI SAP (Tetra Tech, July 2009), 2009 samples were not analyzed for 2-methylnaphthalene; therefore, there are not as many 2-methylnaphthalene analytical results as other compounds analyzed during this investigation.

6.2.2 Selection of Chemicals of Potential Concern

The overall goal of the HHRA is to quantify risks associated with those contaminants that represent a potentially significant human health hazard on the basis of toxicity, environmental concentration, and mobility. USEPA guidance recommends focusing the risk assessment by quantifying risk for only a select list of COPCs at a site. COPCs, which are a subset of all detected contaminants in a given medium, are defined as those contaminants likely to dominate the overall potential risks for a site.

General selection criteria for inorganic and organic COPCs are provided as follows:

- **Toxicity Screening.** Current USEPA guidance recommends using the USEPA (RSL) table (November 2010) for a source of general screening criteria to be used in COPC selection. The USEPA RSLs for residential soil were used as the basis of screening criteria for all receptors for surface and subsurface soil at the site. The residential criteria represent the most conservative land use scenario and thus screening against residential criteria should be conservative for all potential

future land uses. Contaminants with maximum concentrations greater than the RSL for carcinogens or one-tenth the RSL for non-carcinogens were selected as COPCs and carried through the quantitative risk assessment. One-tenth the non-carcinogenic screening level is used to account for potential cumulative effects of multiple compounds affecting the same target organ or producing the same target effect. Maximum contaminant concentrations in soil were not compared to USEPA soil screening levels (SSLs) for migration from soil to air. Instead, all contaminants selected as COPCs were evaluated for the inhalation exposure pathway. Soil data at OU9 were not compared to SSLs for groundwater protection because overburden groundwater is not present at OU9.

Guidance from the Office of Prevention, Pesticides, and Toxic Substances and OSWER recommends 400 mg/kg as the lowest screening level for lead-contaminated soil in a residential setting where children are frequently present (USEPA, February 1994, July 1994, May 2002, and December 2005). To be conservative, 400 mg/kg was used as the screening level for COPC selection at OU9. However, guidance from the USEPA for lead indicates that "a reasonable screening level for soil lead at commercial/industrial (i.e., non-residential) sites is approximately 800 mg/kg for a typical non-contact intensive worker" (June 2009), and the USEPA RSL table for lead in soil, assuming an industrial land use scenario, is 800 mg/kg.

- **Frequency of Detection Screening and Data Set Definition**. The frequency of detection screening includes determining whether or not contaminants are detected in less than 5 percent of the collected soil samples. A contaminant detected in less than 5 percent of the collected soil samples was not selected as a COPC when at least 20 samples were collected, and only when the available data indicate that a contaminant "hot spot" is not present at the site.

- **Background Concentrations Comparison**. Chemical concentrations in site soil samples were also compared to PNS Facility background concentrations using statistical methods, as described in Appendix B. Background data were available for metals and PAHs. Several chemicals were not selected as COPCs based on the results of the background comparison; these chemicals are noted in the dataset-specific COPC selection discussions. The data set-specific results of the background comparisons are presented in Appendix B. The final conclusions of the background comparisons are presented in the COPC selection tables.

The following data sets were used for evaluating risks from exposure to soil:

- Surface Soil (0 to 2 feet bgs) – evaluated for construction workers, occupational workers, recreational users, and hypothetical residents.

- Subsurface Soil (2 to 10 feet bgs) – evaluated quantitatively for construction workers in the risk characterization and for occupational workers, recreational users, and hypothetical residents in the uncertainty analysis to facilitate risk management decisions.

Frequency of detection screening was conducted for each data set separately, and risks for each data set were evaluated separately in the risk assessment. The selection of COPCs for each data set is discussed in the remainder of this section.

Direct Contact COPCs for Surface Soil

RAGS Part D Table 2.1 presented in Appendix C.1 shows the results of the comparison of maximum detected surface soil concentrations at OU9 to screening levels, based on USEPA RSLs for residential soil. The following contaminants were retained as surface soil COPCs because their concentrations in surface soil exceeded screening criteria and facility background concentrations:

- benzo(a)anthracene, benzo(a)pyrene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene

Maximum concentrations of benzo(b)fluoranthene and lead also exceeded screening criteria based on the USEPA residential RSLs but did not exceed facility background concentrations (see Appendix B) and were not retained as COPCs; however, these chemicals are discussed in the Background section of the Risk Characterization (Section 6.5.5).

Direct Contact COPCs for Subsurface Soil

RAGS Part D Table 2.2 presented in Appendix C.1 shows the results of the comparison of maximum detected subsurface soil concentrations to screening levels based on USEPA RSLs for residential soil. The following contaminants were retained as subsurface soil COPCs because their concentrations in subsurface soil exceeded screening criteria and facility background concentrations:

- mercury, 2-methylnaphthalene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene

Maximum concentrations of antimony and lead also exceeded screening criteria based on USEPA residential RSLs but did not exceed facility background concentrations (see Appendix B) and were not

retained as COPCs; however, these chemicals are discussed in the Background Risks section of the risk characterization (Section 6.5.5).

6.3 EXPOSURE ASSESSMENT

The exposure assessment defines and evaluates the exposures experienced by likely receptor populations at a site. The exposure assessment consists of several subsections that characterize the physical site setting and potential receptors of concern. Additionally, the exposure assessment identifies the potential contaminant migration and exposure pathways, defines the contaminant concentrations at the point of exposure, and presents the exposure assumptions used to quantify exposure in terms of contaminant intake (dose). Appendix C.2 of this report presents the intake equations and sample calculations for quantification of contaminant intakes. Spreadsheets presented in Appendix C.1 include contaminant-specific intakes for each receptor at OU9. A summary of potential exposure pathways is provided in the RAGS Part D Table 1 in Appendix C.1. RAGS Part D Table 4s in Appendix C.1 provide exposure parameters used to calculate the contaminant-specific intakes.

6.3.1 Exposure Setting

Site background, history, and a description of sources of environmental contamination, contaminant release mechanisms, and transport/migration pathways are provided in Sections 1.0 and 5.0, respectively, of this report. A detailed description of background screening methodology is presented in Appendix B. Potential exposure routes for air, ingestion, and dermal contact with soil are discussed in this section.

The past and current land use patterns at the site are well established, thereby reducing the uncertainty associated with land use assumptions. PNS is a military facility with restricted access. The current land use for OU9 is commercial/industrial. Building 62 and Building 62 Annex are used by PNS Public Works for storage of non-hazardous materials. The use of the site is likely to remain the same for the foreseeable future. However, residential, recreational, commercial, and/or industrial uses of the site were considered as possible future risk scenarios. Potential current onshore human exposure pathways for surface and subsurface soil are likely for construction workers digging into the soil. Occupational workers who visit the site daily for routine office work or similar activities that do not require contact with soil are not likely to be exposed to soil at OU9 under current conditions. There is a small, relatively flat, grassy area with trees where people could recreate. Recreational users are not likely to be exposed to soil in this area under current conditions because the soil is covered with grass and trees. Future occupational and recreational exposure to surface soil is possible if the asphalt or grass covers were removed, thus exposing site contamination. Residential use of the site is not likely as long as the Shipyard is in

operation; however, hypothetical future residential use was evaluated as a risk scenario that could occur if the Shipyard closed or if the site was developed for other uses.

6.3.1.1 Potential Exposure Routes

Potential receptors can come into contact with contaminants in many ways that are generally the result of interactions between a receptor's behavior or lifestyle and an exposure medium. For the purposes of this assessment an exposure route is defined as a description of the behavior that brings a receptor into contact with a contaminated medium. A CSM for OU9 that displays potential exposure routes is present as Figure 5-2.

6.3.1.1.1 Air

The air pathway is based on the scenario that a receptor inhales air that contains suspended particulates originating from the source area.

Quantitative risk evaluations for inhalation were performed on all chemicals selected as COPCs for all receptors exposed to soil.

The release of subsurface soil contaminants to the atmosphere as fugitive dust and volatile emissions can only occur as a result of ground-intrusive activities and is not expected at OU9 under current land use conditions. Risks due to fugitive dust and volatile emissions were evaluated for current/future construction workers exposed to surface and subsurface soil (Appendix C.1), and the current occupational, current recreational, and potential future residential receptors exposed to surface soil (Appendix C.1). Although occupational, recreational, and residential receptors are not expected to be exposed to fugitive dust from subsurface soil, this pathway was evaluated quantitatively (Appendix C.3) and discussed in the Uncertainty Analysis (Section 6.6) to facilitate risk management decisions.

No ash or tar was found under Building 62; therefore, vapor intrusion of contaminants from ash is not expected to be a significant exposure pathway for Building 62. It is unknown if ash exists under Building 62 Annex. Potentially unacceptable vapor intrusion risks are not anticipated for Building 62 Annex as further discussed in the Uncertainty Analysis (Section 6.6).

6.3.1.1.2 Ingestion and Dermal Contact with Soil

Potential receptors may come into direct contact with soil affected by the release of contaminants from the source area. During the receptor's period of contact, the individual may be exposed via inadvertent ingestion of a small amount of soil or via dermal absorption of contaminants from the soil.

Dermal contact with contaminants detected in soil may or may not result in a significant exposure. For contaminants to be percutaneously absorbed, they must first desorb from soil and diffuse through the skin. Various factors affect the rate of dermal absorption, including the amount of soil on the skin surface, soil characteristics (moisture, pH, organic carbon content, etc.), skin characteristics (thickness, temperature, hydration, etc.), volatilization losses, and contaminant-specific properties. Dermal and ingestion exposures to contaminants in soil were evaluated quantitatively for this risk assessment.

6.3.2 Potential Receptors

Potential receptors were identified for both current and future land use conditions. The receptors were identified by analyzing current land use practices, possible future land use, and identified sources of contamination. Construction workers, occupational workers, and adult recreational users are considered to be potential human receptors for OU9 under current land use.

Construction workers, occupational workers, recreational users (adult and child), and hypothetical residents (adult and child) may be potential receptors under future land use. Although current land use does not include residential land use, land use could potentially include residential use in the future; however, this scenario is unlikely. Potential future recreational users and residents were evaluated to aid in risk management decisions.

6.3.3 Exposure Pathways

The basic exposure assessment assumptions for OU9 are as follows:

- The receptors evaluated include adult, child, and lifetime recreational users; adult, child, and lifetime residents; occupational workers (e.g., the typical industrial/commercial worker performing routine activities), and construction workers (e.g., remediation and excavation).

- The exposure routes include ingestion, dermal contact, and inhalation of air/dust particulates/vapors from soil. The potentially complete exposure pathways are summarized in the following table and discussed in Appendix C.2.

Potentially Complete Exposure Pathways	
Receptors	**Exposure Routes**
Construction workers (current and future)	Soil ingestion (surface and subsurface soil) Soil dermal contact (surface and subsurface soil) Inhalation of air/dust particulates and vapors (surface and subsurface soil)
Occupational worker (current and future) [e.g., typical industrial worker, commercial worker, landscaper, or maintenance worker]	Soil ingestion (surface soil)(1) Soil dermal contact (surface soil)(1) Inhalation of air/dust particulates and vapors (surface soil)1
Recreational users (current and future adult) (future adult and child)	Soil ingestion (surface soil)(1) Soil dermal contact (surface soil)(1) Inhalation of air/dust particulates and vapors (surface soil)1
Residents (future adult and child)	Soil ingestion (surface soil)(1) Soil dermal contact (surface soil)(1) Inhalation of air/dust particulates and vapors (surface soil)(1)

1 Quantitative evaluations of residents, recreational users, and occupational workers for exposure to subsurface soil (2 to 10 feet) are included in Appendix C.3 to facilitate risk management decisions.

The recreational and occupational users are current receptors for exposure to surface soil and potential future receptors for exposure to surface and subsurface soil. The resident is a potential future receptor for exposure to surface and subsurface soil. The construction worker is a current and future receptor for exposure to surface and subsurface soil.

6.3.4 Exposure Point Concentrations

This section summarizes the protocol used in calculating EPCs for OU9 soil.

For calculation of each EPC for soil, the 95-percent upper confidence limit (UCL) on the mean was calculated and used as the EPC unless the 95 percent UCL exceeded the maximum detected concentration. In this case, the maximum detected concentration was used as the EPC for the RME and CTE scenarios. Use of the maximum value is recommended for small data sets because it is often difficult to define the distribution of a data set when fewer than five samples are available. The maximum concentration is also used as the EPC if there are few (i.e., three or less) positive detections in a data set, in accordance with USEPA guidance (May 2010a).

The 95-percent UCLs on the mean for all COPCs were calculated following USEPA's Calculating UCLs for EPCs at Hazardous Waste Sites (December 2002b) and using USEPA's ProUCL (Version 4.1.00, USEPA, May 2010a) software. The sample detection limit was used as an input for non-detected results,

and the non-detected results were evaluated using the procedures in ProUCL. Appendix C.2.2 contains ProUCL output files.

In accordance with USEPA guidance (February 2010, March 2010b), average lead concentrations were used to estimate potential blood-lead levels from exposure to lead. However, lead was not selected as a COPC; therefore, blood-lead levels estimates were not calculated for the primary risk estimates (blood-lead level risk estimates were calculated as part of the background risk evaluation).

An exposure unit (EU) is the area over which receptor activity is expected to occur. The two most important considerations in defining an EU are: 1) the anticipated receptor activity and 2) the spatial distribution of contaminant concentrations. Based on the size and current use of OU9, the EU was assumed to be the entire site, which is approximately 1 acre.

Three different exposure scenarios were considered for each receptor exposure by calculating three different sets of EPCs as follows:

- Entire site: all data were assumed to equally represent site conditions. The entire site EPC calculations result in the most conservative risk estimates for the site and are presented to aid in risk managements decisions.

- Weighted average of excavated and unexcavated areas: excavated and unexcavated areas were assumed to represent 90 and 10 percent of the site, respectively, per the OU9 RI SAP (Tetra Tech, July 2009).

- Weighted average of samples containing ash and burnt material matrices compared to samples not containing ash and burnt material: samples containing ash and burnt materials were assumed to represent 5 percent of the site based on evaluations of boring logs (see Table A.2 in Appendix A.1), and samples not containing ash or burnt material were assumed to represent 95 percent of the site. Based on the CSM, this EPC calculation provides the most realistic representation of current site conditions.

COPC EPCs for OU9 are summarized in RAGS Part D Tables 3.1 through 3.6, presented in Appendix C.1. EPCs for chemicals attributed to background are presented in Appendix C.3.

6.3.5 Quantification of Exposure

Exposure intakes for the identified potential receptor groups were calculated using current USEPA risk assessment guidance (March 1991, August 1997, July 2004, and January 2009). Estimates of exposure

were based on contaminant concentrations at exposure points and on scenario-specific assumptions and intake parameters. In general, standard default parameters that combine mid-range and upper-end exposure factors were used to assess the RME. CTE was assessed primarily by the use of mid-range exposure factors presented in current risk assessment guidance (USEPA, July 1993). The same EPCs and equations were used to estimate intakes under the CTE scenario, but exposure input parameters (e.g., exposure frequencies) were modified to reflect average case exposure. The exposure parameters used for the CTE calculations reflect the latest EPA guidance (see RAGS Part D Table 4s in Appendix C.1). Therefore, the exposure factors for the CTE differ from those used for the RME.

Exposure intake parameters were used in the equations presented in Appendix C.2 along with the previously identified EPCs to estimate contaminant intakes. Individual contaminant intakes for each receptor/exposure route combination at OU9 are presented in the risk assessment spreadsheets in Appendix C.1. Example calculations are provided in Appendix C.2.

6.4 TOXICITY ASSESSMENT

The objective of the toxicity assessment is 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 COPCs. Quantitative toxicity values determined during this component of risk assessment are integrated with outputs of the exposure assessment to characterize the potential for the occurrence of adverse health effects for each receptor group.

The toxicity value used to evaluate non-carcinogenic health effects for ingestion and dermal exposures is the reference dose (RfD). The reference concentration (RfC) is used to evaluate non-carcinogenic health effects for inhalation exposures. RfDs and RfCs are estimates of daily exposure levels for the human population that are likely to be without appreciable risk during a portion of or all of a lifetime. They are based on a review of available animal and/or human toxicity data, with adjustments for various uncertainties associated with the data. Carcinogenic effects are quantified using the cancer slope factor (CSF) for ingestion and dermal exposures and inhalation unit risk (IUR) for inhalation exposures, which is a plausible upper-bound estimate of the probability of cancer development per unit intake of contaminant over a lifetime. It is based on available dose-response data from human and/or animal studies.

6.4.1 Toxicity Criteria for Oral and Inhalation Exposures

Oral RfDs and CSFs and inhalation RfCs and IURs used in this risk assessment were obtained from the following primary USEPA literature sources (December 2003):

- Integrated Risk Information System (IRIS).

- USEPA 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 PPRTVs on a contaminant-specific basis when requested by the USEPA's Superfund program.

- Other Toxicity Values – These sources include but are not limited to California Environmental Protection Agency toxicity values, ATSDR values, and the Annual Health Effects Assessment Summary Tables (HEAST) (USEPA, July 1997).

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 the presented values have been verified by the USEPA. The USEPA RSL table may also be used as a source of toxicity criteria. This table is updated several times a year and reflects recent changes in IRIS. The toxicity criteria for the constituents selected as COPCs are presented in RAGS Part D Tables 5 and 6, in Appendix C.1.

6.4.2 Toxicity Criteria for Dermal Exposure

RfDs and CSFs found in the literature are frequently expressed as administered doses; therefore, these values are considered inappropriate for estimating risks associated with dermal routes of exposure. Oral dose-response parameters, based on administered doses must be adjusted to absorbed doses before comparisons to estimate dermal exposures are made.

When the oral absorption is essentially complete (i.e., 100 percent), the absorbed dose is equivalent to the administered dose, and no toxicity adjustment is necessary. Conversely, when the gastrointestinal absorption of a contaminant is poor (e.g., 1 percent), the absorbed does is smaller than the administered dose; thus, toxicity factors based on the absorbed dose should be adjusted to account for the difference in the absorbed dose relative to the administered dose. USEPA (2004) recommends a cutoff of 50 percent absorption to reflect the intrinsic variability in the analysis of absorption studies. Therefore, the adjustment from administered to absorbed dose was only performed when the contaminant-specific gastrointestinal absorption efficiency was less than 50 percent. The adjustment from administered to absorbed dose was made using contaminant-specific gastrointestinal absorption efficiencies (ABS) published in available guidance [i.e., USEPA, July 2004 (the primary reference); USEPA, 1989, 1998, 2008, and 2009] and 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}	=	RfD for the dermal route of exposure
	RfD_{oral}	=	RfD for the oral route of exposure
	CSF_{dermal}	=	CSF for the dermal route of exposure
	CSF_{oral}	=	CSF of the oral route of exposure

If contaminant-specific gastrointestinal absorption efficiencies were not available, then complete oral absorption was assumed, and oral toxicity values were not adjusted for dermal absorbed doses. The contaminant-specific absorption efficiencies used in this HHRA are presented in RAGS Part D Tables 5.1 and 6.1, presented in Appendix C.1.

6.4.3 Toxicity Criteria for Carcinogenic Effects of PAHs

USEPAs Guidelines for Carcinogen Risk Assessment (March 2005a) and Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens (March 2005b) specify the use of age-dependant adjustment factors (ADAFs) for carcinogens that act via a mutagenic mode of action. Carcinogenic PAHs are included in this group of contaminants determined to act via the mutagenic mode of action. No contaminant-specific ADAFs have been derived for carcinogenic PAHs; therefore, the following defaults from USEPA guidance (March 2005b) were used: 10 for ages 0 to 2, three for ages 2 to 16, and one (no adjustment) for ages 16 to 70.

6.5 RISK CHARACTERIZATION

This section provides the methodologies used for the characterization of potential human health risks associated with exposure to COPCs. Potential human health risks resulting from exposure to COPCs are estimated using algorithms established by the USEPA (December 1989). The USEPA methods are protective of human health and are likely to overestimate (rather than underestimate) risk. The methodology uses specific algorithms to calculate risk as a function of contaminant concentration, human exposure parameters, and toxicity. Note that quantitative risks were not calculated for chemicals eliminated as COPCs due to background comparisons. This is because chemicals with concentrations that exceed screening levels but that do not exceed site background levels are likely representative of regional contamination, not site-related contamination. Therefore, the risk characterization in this section provides estimates only for site-related contaminants at OU9. Uncertainty associated with eliminating chemicals from COPC selection on the basis of background values alone is discussed in Section 6.5.5 and in further detail in Appendix B.

Risks from hazardous contaminants are calculated for carcinogenic and non-carcinogenic effects. Some carcinogenic contaminants may also exhibit non-carcinogenic effects. Potential impacts are then characterized for both types of health effects. Section 6.5.1 defines the characterization methodology for carcinogenic effects, and the methodology for non-carcinogenic effects is described in Section 6.5.2.

6.5.1 Carcinogenic Effects

Quantitative estimates of risk for contaminants other than lead 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.

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 above equation resulted in an ILCR greater than 0.01, the following one-hit equation was used:

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

This is consistent with the linear low-dose model.

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

$$\text{ILCR} = (\text{IUR})(\text{Exposure Concentration})(1000\ \mu\text{g/mg})$$

Estimated ILCRs are compared with the USEPA target risk range of 10^{-6} to 10^{-4}. Risks less than 10^{-6} (1 in 1 million) are generally considered to be “acceptable” by the USEPA, whereas risks greater than 10^{-4} (1 in 10,000) are generally considered to be “unacceptable” by the agency. Depending on the risk management goals for the site, risks within 10^{-6} to 10^{-4} are also typically regarded as “acceptable.” The State of Maine uses an ILCR risk guideline of 10^{-5}.

6.5.2 Non-Carcinogenic Effects

Non-carcinogenic risks were assessed using the concept of Hazard Quotients (HQs) and Hazard Indices (HIs). 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:

$$HQ = (\text{Estimated Exposure Intake})/(RfD)$$

For inhalation exposures, HQ is calculated as follows:

$$HQ = (\text{Exposure Concentration})/(RfC)$$

An HI is generated by summing the individual HQs for all COPCs. If the HI exceeds 1, a potential exists for non-carcinogenic (toxic) effects to occur, and it is necessary to segregate the HQs by target organ effects. HQs for all non-carcinogens are not considered to be truly additive unless similar target organs are affected. If the HI for an individual target organ exceeds 1, a potential exists for adverse non-carcinogenic health effects.

The estimation of non-carcinogenic effects (i.e., calculation of HQs/HIs) should not be construed as a probability in the manner of the ILCR, but rather as a numerical indicator of the extent to which a predicted intake exceeds or is less than an RfD.

6.5.3 Quantitative Risk Estimates – Reasonable Maximum Exposure Evaluation

Quantitative risk estimates for potential human receptors were developed for those contaminants identified as COPCs. Potential non-carcinogenic and carcinogenic risks for construction workers, occupational workers, adult and child recreational users, and adult and child residents under the RME scenario are summarized in Tables 6-1 to 6-6. Risks for each receptor are summed across all applicable exposure routes. Risk spreadsheets containing the detailed contaminant-specific risks for OU9 are included in Appendix C.1. A discussion of the estimated non-carcinogenic and carcinogenic risks is provided in the remainder of this section.

Non-Carcinogenic RME and CTE Risks – Entire Site/Un-weighted Risk Evaluation

No non-carcinogenic chemicals were selected as COPCs in the surface soil data set; therefore, no surface soil HIs were calculated for any of the receptors evaluated in this risk assessment. Adverse non-carcinogenic effects are not anticipated from exposure to surface soil. The cumulative HI calculated for the construction worker exposed to entire site subsurface soils for the RME evaluation was equal to 1 and

was less than 1 for the CTE evaluation; therefore, adverse non-carcinogenic effects are not anticipated for the construction worked exposed to subsurface soils. Subsurface soil risks for all other receptors are discussed in the uncertainty section.

Non-Carcinogenic RME and CTE Risks – EPCs Weighted 90 Percent Excavated Area and 10 Percent Unexcavated Area

No non-carcinogenic chemicals were selected as COPCs in the surface soil data set; therefore, no surface soil HIs were calculated for any of the receptors evaluated in this risk assessment. Adverse non-carcinogenic effects are not anticipated from exposure to surface soil.

The cumulative HI calculated for the construction worker exposed to subsurface soils was less than 1 for the RME and CTE scenarios; therefore, adverse non-carcinogenic effects are not anticipated for the construction worked exposed to subsurface soils. Subsurface soil risks for all other receptors are discussed in the uncertainty section.

Non-Carcinogenic RME and CTE Risks – EPCs Weighted 95 Percent for Samples With No Ash/Burnt Material and 5 Percent for Samples With Ash/Burnt Material

No non-carcinogenic chemicals were selected as COPCs in the surface soil data set; therefore, no surface soil HIs were calculated for any of the receptors evaluated in this risk assessment. Adverse non-carcinogenic effects are not anticipated from exposure to surface soil.

The cumulative HI calculated for the construction worker exposed to subsurface soils was less than 1 for the RME and CTE scenarios; therefore, adverse non-carcinogenic effects are not anticipated for the construction worked exposed to subsurface soils. Subsurface soil risks for all other receptors are discussed in the uncertainty section.

Carcinogenic RME and CTE Risks – Entire Site/Un-weighted Risk Evaluation

Carcinogenic risks estimated under the RME evaluation for occupational workers, recreational users (adult, child, and lifetime), and adult residents exposed to surface soil and construction workers exposed to surface and subsurface soil are within the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$. Carcinogenic risks estimated under the RME evaluation for child and lifetime residents exposed to surface soil exceeded the USEPA target risk range. The cumulative ILCRs for surface soil were $2x10^{-4}$ for child residents and $3x10^{-4}$ for lifetime residents. The carcinogenic PAHs were the primary risk contributors.

Carcinogenic risks estimated under the RME evaluation for adult recreational users exposed to surface soil and construction workers exposed to surface soil did not exceed the State of Maine risk guideline of $1x10^{-5}$. Carcinogenic risks estimated under the RME for construction workers exposed to subsurface soil, occupational workers exposed to surface soil, child and lifetime recreational users exposed to surface soil, and child, adult, and lifetime residents exposed to surface soil exceed the State of Maine risk guideline, with cumulative ILCRs of $6x10^{-5}$, $2x10^{-5}$, $4x10^{-5}$, and $5x10^{-5}$, $2x10^{-4}$, $4x10^{-5}$, and $3x10^{-5}$, respectively. The primary contributors to these cancer risks are carcinogenic PAHs.

Carcinogenic risks estimated under the CTE evaluation did not exceed the USEPA target risk range for any of the scenarios evaluated in the risk characterization (i.e. all receptors exposed to surface soil except the construction worker exposed to surface and subsurface soil). The child resident exposed to surface soil exceeded the State of Maine cancer risk guideline under the CTE evaluation with an estimated cancer risk of $2.6x10^{-5}$.

Subsurface soil risks are for all receptors other than the construction worker are discussed in the Uncertainty Section 6.6

Carcinogenic RME and CTE Risks – EPCs Weighted 90 Percent Excavated Area and 10 Percent Unexcavated Area

Carcinogenic risks estimated under the RME scenario for occupational workers, recreational users (adult, child, and lifetime), and residents (adult, child, and lifetime) exposed to surface soil and construction workers exposed to surface and subsurface soil are less than or within the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Carcinogenic risks estimated under the RME scenario for construction workers exposed to surface soil and subsurface soil, occupational workers, recreational users (adult, child, and lifetime), and adult residents exposed to surface soil did not exceed the State of Maine risk guideline of $1x10^{-5}$. Carcinogenic risks for child and lifetime residents exposed to surface soil exceed the State of Maine risk guideline. Cumulative ILCRs are $7x10^{-5}$ and $9x10^{-5}$ for child and lifetime residents, respectively. The primary contributors to these cancer risks are carcinogenic PAHs.

Carcinogenic risks estimated under the CTE evaluation did not exceed the USEPA or State of Maine target risk range for any of the scenarios evaluated in the risk characterization (i.e. all receptors exposed to surface soil except the construction worker exposed to surface and subsurface soil).

Subsurface soil risks are for all receptors other than the construction worker are discussed in the Uncertainty Section 6.6

Carcinogenic RME and CTE Risks – EPCs Weighted 95% for Samples With No Ash/Burnt Material and 5% for Samples With Ash/Burnt Material

The carcinogenic risks estimated under the RME scenario for occupational workers, recreational users (adult, child, and lifetime), and residents (adult, child, and lifetime) exposed to surface soil and construction workers exposed to surface and subsurface soil are less than or within the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Carcinogenic risk estimated under the RME scenario for construction workers exposed to surface and subsurface soil, occupational workers, child, adult, and lifetime recreational users, and adult residents exposed to surface soil did not exceed the State of Maine risk guideline of $1x10^{-5}$. The carcinogenic risks for child and lifetime residents exposed to surface soil exceed the State of Maine risk guideline with cumulative ILCRs of $6x10^{-5}$ and $7x10^{-5}$, respectively. The primary contributors to these cancer risks are carcinogenic PAHs.

Carcinogenic risks estimated under the CTE evaluation did not exceed the USEPA or State of Maine target risk range for any of the scenarios evaluated in the risk characterization (i.e. all receptors exposed to surface soil except the construction worker exposed to surface and subsurface soil).

Subsurface soil risks are for all receptors other than the construction worker are discussed in the Uncertainty Section 6.6

6.5.4 Exposure to Lead from Site Sources

Lead was not selected as a COPC for any exposure scenarios evaluated in this risk assessment; therefore, the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) Model (February 1994, May 2002, May 2009, and June 2009a) and the Technical Review Workgroup (TRW) Adult Lead Model were not used to estimate blood-lead concentrations. Exposure to lead in soils at OU9 is not considered to present unacceptable site risks; therefore, lead was not selected as a COPC. Lead risks were evaluated using the USEPA IEUBK Model for the background risks evaluation (see Section 6.5.5.1).

6.5.5 Background Risks

A background screen (i.e., a data set-to-data set comparison) was conducted for contaminants exceeding screening criteria in surface and subsurface soil at OU9 (see Appendix B). The following contaminants were eliminated from COPC selection as a result of the background screen alone:

- Surface Soil: benzo(b)fluoranthene and lead.

- Subsurface Soil: antimony and lead.

A contaminant name is presented in **bold** font if the maximum concentration of the contaminant would exceed the unadjusted RSL (i.e., RSL based on an ILCR = $1x10^{-6}$ or HI = 1).

Carcinogenic risks including chemicals within background estimated for occupational workers, recreational users (adult, child, and lifetime), and adult residents exposed to surface soil and construction workers exposed to surface and subsurface soil are within the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$. Carcinogenic surface soil risks estimated for potential future residents (lifetime and child) exceeded the USEPA target risk range at estimated ILCR values of $3x10^{-4}$ for both receptors.

Carcinogenic surface soil risks estimated for occupational workers, recreational users (child and lifetime), potential future residents (lifetime, child, and adult), and subsurface soil risks for construction workers exceeded the State of Maine risk guideline of $1x10^{-5}$. The primary contributors to these cancer risks are carcinogenic PAHs.

Target organ/system HIs did not exceed 1 for any of the receptors evaluated; therefore, adverse non-carcinogenic risks from exposure to site soils are not anticipated for any of the receptors evaluated.

6.5.5.1 Exposure to Lead from Background

Exposure to lead in surface soil was assessed using the mean surface soil (entire site) lead concentration of 340 mg/kg. Results of the lead exposure evaluations are presented in Appendix C.3.

IEUBK Model results for the child resident exposure to surface soil lead indicate that 2.4 percent of children could have a blood-lead concentration that exceeds 10 µg/dL (geometric mean = 4). This does not exceed the USEPA goal that no more than 5 percent of children should have blood-lead concentrations exceeding 10 µg/dL.

No further blood-lead modeling was conducted using the IEUBK Model or TRW Adult Lead Model because the average concentration of lead in surface soil (340 mg/kg) was greater than the average lead concentrations in subsurface soil (170 mg/kg). Because the lead concentration with the highest EPC (surface soil 340 mg/kg) was evaluated using the most conservative blood-lead modeling protocol (IEUBK) and lead risks were found to be acceptable, conducting lead model analysis with lower lead average concentrations would also result in acceptable risks.

6.6 UNCERTAINTY ANALYSIS

The uncertainties associated with the HHRA are presented in this section. Deviations from the SAP (Tetra Tech, July 2009) are also discussed in this section. Uncertainty in the selection of COPCs is related to the current status of the predictive databases, grouping of samples, and 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/scenario, assumptions made to determine EPCs, and predictions regarding future land use 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 for determining the carcinogenicity of COPCs. Uncertainty in risk characterization includes that associated with exposure to multiple contaminants and the cumulative uncertainty from combining conservative assumptions made in earlier steps of the risk assessment process.

Whereas there were various sources of uncertainty described earlier, the direction of uncertainty can be influenced by the assumptions made throughout the risk assessment, including selection of COPCs and selection of values for dose-response relationships. Throughout the entire risk assessment, assumptions are made, which consider safety factors, so that the final calculated risks are overestimated.

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 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 the information needed to complete the toxicity and exposure assessments. Often, this gap is significant, such as the absence of information on the effects of human exposure to low doses of a contaminant; on the biological mechanism of action on a contaminant; or on the behavior of a contaminant in soil.

Once the risk assessment is complete, the results must be reviewed and evaluated to identify the type and magnitude of uncertainty involved. Reliance on results from a risk assessment without consideration of uncertainties, limitations, and assumptions inherent in the process can be misleading. For example, to account for uncertainties in the development of exposure assumptions, conservative estimates must be made to ensure that the particular assumptions used are protective of sensitive subpopulations or maximum 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 a much larger uncertainty for the final 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 those results must be considered when making risk management decisions.

This interpretation 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., $1x10^{-6}$), the interpretation of no significant risk is typically straightforward. However, when risks calculated using high degrees of uncertainty exceed “acceptable” risk levels (i.e., $1x10^{-4}$) a conclusion can be difficult unless uncertainty is considered.

6.6.1 Uncertainty in Selection of Chemicals of Potential Concern

A minor amount of uncertainty is associated with the selection of COPCs that may affect the numerical risk estimates presented in the risk assessments. The most significant issues related to uncertainty in COPC selection are the existing data-base (i.e., the quality of the analytical data), the delineation of surface compared to subsurface soil, the inclusion of contaminants potentially attributable to background, the screening levels used, and the surrogate screening levels used for a few contaminants detected in soil. A brief discussion of each of these issues is provided in the remainder of this section.

Existing Database

Soil analytical data from samples collected on site were used to evaluate potential risks to human receptors. According to previously published site documents, all of the data used in the OU9 HHRA were validated. Therefore, only limited uncertainty is associated with the analytical data sets, as summarized in Section 6.2.

Surface and Subsurface Soil Delineation

For the purposes of this risk assessment, the list of COPCs for surface soil was developed using data from samples collected from 0 to 2 foot bgs. In addition, exposure to subsurface soil was evaluated with a data set that included soil samples collected between 2 and 10 feet bgs. Subsurface soil was evaluated where appropriate (i.e., for the construction worker) for total receptor risks. Subsurface soil risks are also considered for the remaining receptors in Appendix C.3, although exposure of these receptors to subsurface soil at OU9 is unlikely.

Contaminants Potentially Attributable to Background

COPCs for OU9 were selected, in part, using available background concentrations for surface and subsurface soil. A statistical data set-to-data set background comparison was conducted to determine if

site concentrations exceeded background concentrations for contaminants with concentrations exceeding screening criteria (see Appendix B).

COPC Screening Levels

The use of screening values based on conservative land use scenarios (i.e., residential land use for soil) corresponding to ILCRs of $1x10^{-6}$ and HIs of 0.1 should ensure that the significant risk-contributing contaminants from OU9 were evaluated. The elimination of contaminants present at concentrations that correspond to ILCRs less than $1x10^{-6}$ or HIs less than 0.1 should not affect the final conclusions of the risk assessment because these contaminants are not expected to cause a potential health concern for the receptors identified at the concentrations detected.

Surrogate Screening Levels

During COPC screening, the following surrogates were used for some contaminants lacking screening levels: acenaphthalene was used as a surrogate for acenaphthylene, and pyrene was used as a surrogate for benzo(g,h,i)perylene and phenanthrene. Applying toxicity values of one compound to another adds to the uncertainty in the risk assessment, both in regard to the selection of COPCs and in the subsequently calculated risks. The direction of the bias is unknown.

6.6.2 Uncertainty in the Exposure Assessment

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

Land Use

The past and current land use patterns at the site are well established, thereby reducing the uncertainty associated with land use assumptions. PNS is a military facility with restricted access. The current land use for OU9 is commercial/industrial. Building 62 and Building 62 Annex are used by PNS Public Works for storage of non-hazardous materials. The use of the site is likely to remain the same for the foreseeable future. However, residential, recreational, commercial, and/or industrial uses of the site were considered as possible future risk scenarios. Occupational workers who visit the site daily for routine office work or similar activities that do not require contact with soil are not likely to be exposed to soil at OU9 under current conditions. Recreational users are not likely to be exposed to soil in this area under current conditions because the soil is covered with grass and trees. Future occupational and recreational exposure to surface soil is possible if the asphalt or grass covers were removed, thus exposing site contamination. Residential use of the site is not likely as long as the Shipyard is in operation; however,

hypothetical future residential use was evaluated as a risk scenario that could occur if the Shipyard closed or if the site was developed for other uses.

Exposure Point Concentrations

Uncertainty is associated with use of 95-percent UCLs on the mean concentrations as EPCs. As a result of using 95-percent UCLs, the estimations of potential risk for the RME scenario are most likely to be overstated because the 95-percent UCL is a representation of the upper limit to which potential receptors would be exposed over the entire exposure period. Uncertainty is introduced when non-detects are incorporated into the UCL calculation by using detection limits as input values for non-detects when using ProUCL software. This may overstate the risks to the receptors if detection limits are elevated. However, this methodology is in accordance with USEPA guidance (May 2010a).

Exposure Routes and Receptor Identification

An attempt was made to simplify the various receptor groups and exposure routes of potential concern in this report. The uncertainty associated with this approach is minimal because exposure routes and potential receptors are considered to be well defined based on the land use observed at the site. The conservative exposure assumptions used in the risk assessment should be protective of receptor use at the site.

Risks and hazard indices were estimated for child recreational users. However, it should be noted that child recreational users are not current receptors but are only potential future receptors. The adult recreational user is considered both a current and potential future receptor.

As stated previously, vapor intrusion of contaminants from ash is not expected to be a significant exposure pathway for Building 62 because no ash or tar was found under Building 62. However, it is unknown if ash exists under Building 62 Annex. Therefore an evaluation was performed to determine if there may be a potentially unacceptable vapor intrusion risk to Building 62 Annex.

Chemicals detected in RI soil samples were first evaluated to determine if they are sufficiently volatile and toxic via the inhalation pathway to pose a potential vapor intrusion risk. Vapor intrusion guidance from USEPA (2002) and DoD (2009) presents methodology for determining if chemicals should be evaluated for vapor intrusion. Both guidances define a chemical as being sufficiently volatile if its Henry's Law Constant is greater than $1x10^{-5}$ atm-m^3/mole. Strictly following the guidance indicates naphthalene and benzo(a)anthracene are the only PAHs which should be evaluated for vapor intrusion. However, the Henry's Law Constant for benzo(a)anthracene is $1.2x10^{-5}$, which only slightly exceeds $1x10^{-5}$, and

benzo(a)anthracene is not considered to be a volatile (USEPA, 2011). Therefore, only naphthalene was evaluated for vapor intrusion risks.

To evaluate the potential for vapor intrusion for Building 62 Annex, the Johnson and Ettinger (JEE) Vapor Intrusion Model (USEPA, 2004) was used to estimate potential vapor intrusion risks from soil concentrations. Several key assumptions were made so that inputs into the JEE model are representative of site conditions. The first key assumption is that there is a layer of ash/burnt material approximately one foot thick directly underneath the slab of Building 62 Annex. This assumption was made based on the excavation cross-section figures (shown in Appendix C.3) from the Site 34 Closeout Report (Shaw, July 2008) which show that on average approximately one foot of ash material was excavated underneath the former slab for Building 63. Next, a potential naphthalene soil concentration in potential ash underneath of Building 62 Annex was calculated by determining the 95-percent UCL of naphthalene concentrations in surface soil samples that contained ash/burnt material (ProUCL Version 4.1.00 output in Appendix C.3). In addition, the following input parameters were used: 45°F as the soil temperature; a soil type of sand (the most conservative); an enclosed space height of 300 cm and indoor air exchange rate of 1.5 1/h (based on industrial use); an exposure duration of 25 years and an exposure frequency of 250 days per year based on typical industrial workers exposure assumptions. Inputs for Building 62 Annex floor width and length were estimated from the Site 34 Shoreline Stabilization and Removal Action Excavation figure (Shaw, July 2008) shown in Appendix C.3.

The JEE model output files for naphthalene are included in Appendix C.3. Using the above input parameters results in an ILCR of 3.6×10^{-5} and an HQ of 0.8. The estimated ILCR is within the USEPA target cancer risk range of 1×10^{-6} to 1×10^{-4} and slightly greater than the State of Maine risk guideline of 1×10^{-5}. The estimated HQ is less than 1, indicating that adverse noncarcinogenic effects are not anticipated.

The JEE model outputs are conservative estimates based on conservative assumptions. For example, the JEE model assumes that contaminants do not undergo chemical or biological transformations and that all contaminant vapors originating below the building will enter the building (i.e. the model does not allow vapors to flow around the building and not enter the structure). Those assumptions over predict vapor intrusion into a structure and therefore overestimate potential risks. Therefore, unacceptable risks are not expected for Building 62 Annex due to vapor intrusion for the occupational worker.

Occupational, Recreational, and Residential Exposures to Subsurface Soil

The risk assessment assumed that occupational workers, recreational users, and future hypothetical residents would only be exposed to surface soil. The possibility that subsurface soils would be excavated and spread across the land surfaces and that the future land use would be residential is very remote.

However, for purposes of completeness, the Navy has included a quantitative evaluation of occupational worker, recreational user, and hypothetical future resident exposure to subsurface soil contamination (to a depth of 10 feet) in Appendix C.3. Results of these receptors' exposures to subsurface soil are discussed in this section. Summaries of subsurface soil risks for the RME scenario are presented in Tables 6-1 to 6-6.

Estimated RME and CTE Risks for Occupational Workers, Recreational Users, and Future Residents Exposed to Subsurface Soil using Un-weighted EPCs

For the RME, total ILCRs for subsurface soil exceeded the State of Maine and USEPA target cancer risk levels for occupational workers, recreational users (adult, child, and lifetime), and future residents (adult, child, and lifetime). The subsurface soil cumulative HI exceeded 1 for child residents, but target organ-specific HIs did not exceed 1; therefore, adverse non-carcinogenic effects are not anticipated.

For the CTE, subsurface soil ILCRs exceeded $1x10^{-5}$ for occupational workers, child, adult, and lifetime recreational users, and future residents (adult, child, and lifetime). Subsurface soil ILCRs exceeded $1x10^{-4}$ for child and lifetime recreational users and future child and lifetime residents. Unacceptable subsurface soil ILCRs are due to carcinogenic PAHs.

Estimated RME and CTE Risks for Occupational Workers, Recreational Users, and Future Residents Exposed to Subsurface Soil using EPCs Weighted 90 Percent Excavated Area and 10 Percent Unexcavated Area

For the RME, total ILCRs for subsurface soil exceeded the State of Maine target cancer risk level of $1x10^{-5}$ for occupational workers, recreational users (adult, child, and lifetime), and future residents (adult, child, and lifetime). Risks for the occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime) also exceeded the USEPA target risk range (1×10^{-6} to 1×10^{-4}). No subsurface soil HIs exceeded 1 for any of the aforementioned receptors.

For the CTE, subsurface soil ILCRs exceeded the state of Maine target cancer risk level for occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime). Subsurface soil ILCRs exceeded the USEPA target cancer risk level for future residents (child and lifetime). Unacceptable subsurface soil ILCRs risks are due to carcinogenic PAHs. No subsurface soil HIs exceeded 1 for any of the aforementioned receptors.

Estimated RME and CTE Risks for Occupational Workers, Recreational Users, and Future Residents Exposed to Subsurface Soil using EPCs Weighted 95 Percent for Samples With No Ash/Burnt Material and 5 Percent for Samples With Ash/Burnt Material

For the RME, total ILCRs for subsurface soil exceeded the State of Maine target cancer risk level of $1x10^{-5}$ for occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime). Risks for future residents (child, and lifetime) also exceeded the USEPA target risk range ($1x10^{-6}$ to $1x10^{-4}$). No subsurface soil HIs exceeded 1 for any of the aforementioned receptors.

For the CTE, subsurface soil ILCRs exceeded $1x10^{-5}$ for recreational users (child and lifetime) and future residents (child, and lifetime). No subsurface soil ILCRs exceeded the USEPA target risk range. Unacceptable cumulative ILCRs risks are due to carcinogenic PAHs. No subsurface soil HIs exceeded 1 for any of the aforementioned receptors.

The preceding summary indicates that additional risks are possible for occupational workers, recreational users, and future residents exposed to subsurface soil. Risk drivers in subsurface soil for these receptors are carcinogenic PAHs.

Receptors/Pathways Not Evaluated

Receptor exposure to groundwater was not evaluated in this HHRA. Construction workers are not expected to be exposed to groundwater because groundwater is not present in the overburden at OU9. Occupational workers/residents are not expected to be exposed to groundwater because the Shipyard is supplied with potable water. Therefore, no significant uncertainty is added to the risk assessment because receptors were not evaluated for groundwater exposures.

Exposure Parameters

Each exposure factor selected for use in the risk assessment has some associated uncertainty. Generally, exposure factors are based on surveys of physiological and lifestyle profiles across the United States. The attributes and activities studied in these surveys generally have a broad distribution. To avoid underestimating exposure, USEPA guidelines (March 1991) on the RME receptor were used in most cases, which generally specify the use of 95th percentile for most parameters; therefore, the selected values for the RME receptor represent the upper bound of the observed or expected habits of the majority of the population.

Generally, uncertainty can be assessed quantitatively for many assumptions made in determining factors for calculating exposures and intakes. Many of these parameters were determined from statistical

analyses on human population characteristics. Often the database used to summarize a particular exposure parameter (i.e., body weight) is quite large. Consequently, the values chosen for such variables in the RME scenario have low uncertainty. For many parameters for which limited information exists (i.e., dermal absorption of organic contaminants from soil), there is greater uncertainty.

Many of the exposure parameters used to calculate exposures and risks in this report were selected from a distribution of possible values, including USEPA guidance (March 1991, May 1993, August 1997, July 2004). Maine guidelines for risk assessments (MEDEP, 1994) were updated with current USEPA values. For the RME scenario, the value representing the 95th percentile is generally selected for each parameter to ensure that the assessment bounds the actual risks from a postulated exposure. This risk number is used in risk management decisions but does not indicate what a more average or typical exposure might be, or what risk range might be expected for individuals in the exposed population.

To address these issues, the USEPA (February 1992) suggested the use of the CTE receptor, whose intake variables are often set at approximately the 50th percentile of the distribution. The risks for this receptor seek to incorporate the range of uncertainty associated with various intake assumptions. Some of the parameters presented in this risk assessment were estimated using professional judgment, although the USEPA does provide limited guidance for the CTE evaluation (May 1993).

6.6.3 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

Toxicity assessment uncertainty is associated with hazard assessment and dose-response evaluations for the COPCs. The hazard assessment deals with characterizing the nature and strength of the evidence of causation, or the likelihood that a contaminant that induces adverse effects in animals will also induce adverse effects in humans. Hazard assessment of carcinogenicity is 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, the animal data cannot necessarily be used to predict the target tissue in humans. However, in the hazard assessment of non-cancer effects, positive animal data often suggest the nature of the effects (i.e., the target tissues and type of effects) 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, gender, and exposure

route, when the magnitude of the response is clearly dose-related, when pharmacokinetic data indicate a similar fate in humans and animals, when postulated mechanisms of toxicity are similar for humans and animals, and when the COPC is structurally similar to other contaminants for which toxicity is more completely characterized. Because of the great variability in factors affecting the uncertainty arising from the nature and quality of animal and human data, the direction of bias (i.e., more or less conservative) is generally not known.

Uncertainty in the dose-response evaluation includes the determination of a CSF for the carcinogenic assessment and derivation of an RfD or RfC 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 with animals that are very similar in age and genotype, so that intragroup biological variation is minimal, but 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 exposure reflect a bias because only those individuals sufficiently healthy to attend work regularly (the "healthy worker effect") and those not unusually sensitive to the contaminant 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 itself. For cancer effects, the uncertainty associated with dose-response factors is 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 from animal data, is based on a non-threshold assumption of carcinogenesis. However, evidence suggests that epigenetic carcinogens, as well as many genotoxic carcinogens, have a threshold below which they are non-carcinogenic (Williams and Weisburger, 1991); therefore, the use of the linearized multistage model is conservative for contaminants that exhibit a threshold for carcinogenicity.

For non-cancer effects, additional uncertainty factors may be applied in the derivation of the RfD or RfC to mitigate poor quality of the key study or gaps in the database. Uncertainty for non-cancer effects arises from the use of an effect level in the estimation of an RfD or RfC because this estimation is predicated on the assumption of a threshold less than which adverse effects are not expected. Therefore, an uncertainty factor is usually applied to estimate a no effect level. Additional uncertainty arises in estimation of an RfD or RfC for chronic exposure from sub chronic data. Unless empirical data indicate that effects do not worsen with increasing duration of exposure, an additional uncertainty factor is applied to the no effect level in the subchronic study. Uncertainty in the derivation of RfDs is mitigated by the use of uncertainty and modifying factors that normally range between 3 and 10. The resulting combination of

uncertainty and modifying factors may reach 1,000 or more. The use of uncertainty and modifying factors tends to increase the conservatism in the risk assessment.

The derivation of dermal RfDs and CSFs from oral values may cause uncertainty, particularly when no gastrointestinal absorption rates are available in the literature, or when only qualitative statements regarding absorption are available. If adjustments for gastrointestinal absorption are not made, risks from dermal exposure may be underestimated by the use of oral RfDs.

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 non-carcinogenic 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 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 non-carcinogenic risks. Although this overestimation of non-carcinogenic risks do not affect the conclusions of this HHRA since non-carcinogenic risks for construction workers were within acceptable levels.

Uncertainty Associated with Evaluation of the Dermal Exposure Pathway

Uncertainty is associated with evaluation of the dermal pathway. USEPA Region I only assesses risks to contaminants for which absorption efficiency values are provided in RAGS Part E, for which this assessment are PAHs. Therefore, the dermal route of exposure has been evaluated quantitatively for these contaminants only. Risks from dermal exposure to antimony and mercury identified as COPCs at OU9 were not quantified in the risk assessment. Consequently, potential risks may be underestimated by excluding these constituents from the dermal risk assessment calculations.

The quantitation of the dermal pathway for PAHs may add additional uncertainty to the risk assessment because it may not be appropriate to use the oral slope factor to evaluate risks from dermal exposure to PAHs (USEPA, December 1989). This is because PAHs are known to cause skin cancer at the point of contact rather than from systemic action.

6.6.4 Uncertainty in the Risk Characterization

Uncertainty in risk characterization results primarily from assumptions made regarding additive effects from exposure to multiple COPCs from various exposure routes. High uncertainty exists when summing

cancer risks for several substances across different exposure pathways. This assumes that each substance has a similar effect and/or mode of action. Often compounds affect different organs, have different mechanisms of action, and differ in their fate in the body, so additivity may not be an appropriate assumption. However, the assumption of additivity is made to provide a conservative estimate of risk.

Finally, the risk characterization does not consider antagonistic or synergistic effects. Little or no information is available to determine the potential for antagonism or synergism for the COPCs. Therefore, this uncertainty cannot be discussed for its impact on the risk assessment and it may either underestimate or overestimate potential human health risk.

6.6.5 Deviations from the Work Plan

The methodology presented in the SAP (Tetra Tech, July 2009) was followed in the HHRA evaluation of OU9 except as noted in this section.

Background Risks

Background risks are presented in the risk characterization section rather than the uncertainty section, as planned in the SAP. Current Maine risk guidance (MEDEP, July 2009) recommends calculating all site risks including background; however, Navy policy is to screen out chemicals concentrations within site background levels. Both sets of risks are discussed (with and without chemicals within site background concentrations) in the risk characterization section.

Exposure Point Concentrations

According to the SAP, EPCs were to be calculated by weighting samples in the excavated area 90 percent and weighting samples in the unexcavated area 10 percent. Weighting of samples in this manner and subsequent calculation of UCLs is not readily completed using ProUCL software, which is recommended by the USEPA for determining EPCs. Therefore, EPCs were calculated without weighting any areas of the site using ProUCL software. EPCs were also calculated by weighting samples from the excavated area 90 percent and samples from the unexcavated area 10 percent in order to comply with the SAP. A third set of EPCs were calculated for which 95 percent weight was given to samples without ash and burnt material and 5 percent weight was given to samples with ash and burnt material, because at the conclusion of the investigation, data indicated that those portions are the most representative of actual site conditions.

Software and Guidance Updates

Updated software and guidance from that presented in the 2009 SAP were available for ProUCL. Current USEPA ProUCL software and guidance (Version 4.1.00) were used for calculating 95 percent UCLs used as EPCs. The SAP also stated that 1994 Maine guidance would be considered for use in the risk assessment. However, the most recent version of Maine's risk assessment guidance (MEDEP, July 2009) was considered instead.

6.7 SUMMARY AND CONCLUSIONS

This section presents a summary of the major risk assessment findings for OU9. Four potential receptor groups were evaluated: current and future construction workers, current and future lifetime, adult, and child recreational users, future lifetime, adult and child residents, and future occupational workers. The risk characterization section of the HHRA evaluated risks to all receptors across the entire site using three different sets of EPCs: un-weighted, 90-percent weight to excavated area, 10-percent weight to unexcavated area, and 95-percent weight to samples with no ash/burnt material and 5-percent weight to samples with ash/burnt material. The Uncertainty Analysis considered subsurface soil exposure for receptors not evaluated for subsurface soil exposure in the risk characterization (i.e., all receptors except the construction worker).

6.7.1 Summary of Risks – Risk Characterization

This section summarizes potentially unacceptable risks. In all cases of potentially unacceptable risk the primary contaminant contributors are PAHs.

6.7.1.1 Non-Carcinogenic Risks

No adverse non-carcinogenic effects are anticipated for any of the receptors under any of the exposure scenarios evaluated.

6.7.1.2 Carcinogenic Risks

Entire Site/Un-weighted Risk Evaluation

RME cancer risks for child and lifetime residents exceed the USEPA target cancer risk range. RME cancer risks for child and lifetime recreational users exposed to surface soil, construction workers exposed to subsurface soil, occupational workers exposed to surface soil, and child, adult, and lifetime residents exposed to surface soil exceed the State of Maine risk guideline. The CTE cancer risk estimates for the child resident exceeds the MEDEP target cancer risk level.

EPCs Weighted 90 Percent Excavated Area and 10 Percent Unexcavated Area

RME cancer risks for child and lifetime residents exposed to surface soil exceed the State of Maine risk guideline.

EPCs Weighted 95 Percent for Samples With No Ash/Burnt Material and 5 Percent for Samples With Ash/Burnt Material

RME cancer risks for child and lifetime residents exposed to surface soil exceed the State of Maine risk guideline.

Background Risks

RME cancer risk estimates for child and lifetime residents exceed the USEPA target cancer risk range. RME cancer risks for child and lifetime recreational users exposed to surface soil, construction workers exposed to subsurface soil, occupational workers exposed to surface soil, and child and lifetime residents exposed to surface soil exceed the State of Maine risk guideline. CTE cancer risk estimates exceed the MEDEP target cancer risk level for child residents.

6.7.1.3 Exposure to Lead

Lead was not selected as a COPC for any of the matrices evaluated during this risk assessment because lead concentrations were determined to be within site background concentrations; however, blood-lead concentrations were modeled for the background evaluation, as described below.

During the background evaluation, lead-blood concentrations were modeled using the greatest average lead concentration calculated (surface soil) and the most conservative modeling approach in the Work Plan (IEUBK). IEUBK model results for the child resident exposure to lead in surface soil indicate that 2.4 percent of children could have a blood-lead concentration that exceeds 10 µg/dL (geometric mean = 4). This does not exceed the USEPA goal that no more than 5 percent of children should have blood-lead concentrations exceeding 10 µg/dL. Because the lead concentration with the greatest EPC (surface soil 340 mg/kg) was evaluated using the most conservative blood-lead modeling protocol (IEUBK analysis) and the lead risks were found to be acceptable, lead models with lower lead average concentrations would also result in acceptable risks.

6.7.2 Summary of Risks – Uncertainty Analysis

Subsurface soil risks were estimated for the occupational workers, recreational users (lifetime, adult, and child), and potential future residents (lifetime, adult, and child) in the uncertainty analysis. The following is a summary of the potentially unacceptable risk estimates from that evaluation.

6.7.2.1 Non-Carcinogenic Risks

No adverse non-carcinogenic effects are anticipated for any of the receptors under any of the exposure scenarios evaluated in the uncertainty analysis.

6.7.2.2 Carcinogenic Risks

Estimated Risks for Occupational Workers, Recreational Users, and Future Residents to Subsurface Soil using Un-weighted EPCs

For the RME, total ILCRs for subsurface soil exceeded the State of Maine and USEPA target cancer risk level for occupational workers, recreational users (adult, child, and lifetime), and future residents (adult, child, and lifetime).

Cumulative surface/subsurface ILCRs exceeded USEPA's target risk range for recreational users (child and lifetime) and future residents (child and lifetime). For the CTE, cumulative surface/subsurface ILCRs exceeded the State of Maine target cancer risk level for occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime).

Estimated Risks Occupational Workers, Recreational Users, and Future Residents Exposed to Subsurface Soil when EPCs Weighted 90 Percent Excavated Area and 10 Percent Unexcavated Area

For the RME, total ILCRs for subsurface soil exceeded the USEPA and State of Maine target cancer risk levels for occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime). Adult recreational users), were greater than the MEDEP target risk range. .

For the CTE, cumulative subsurface ILCRs exceeded USEPA's target cancer risk range for future residents (child and lifetime). Cumulative subsurface ILCRs exceeded the State of Maine's target cancer risk range for occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime).

Estimated Risks for Occupational Workers, Recreational Users, and Future Residents Exposed to Subsurface Soil when EPCs Weighted 95 Percent for Samples with No Ash/Burnt Material and 5 Percent for Samples with Ash/Burnt Material

For the RME, future resident (child and lifetime) risks exceeded the USEPA target risk range and total ILCRs for subsurface soil exceeded the State of Maine target cancer risk level for occupational workers, recreational users (child and lifetime), and future residents (adult, child, and lifetime). For the CTE, cumulative subsurface ILCRs exceeded the State of Maine target cancer risk level for future residents (child and lifetime).

6.7.3 Human Health Risk Assessment Risk Drivers

Risk Drivers – Risk Characterization

Based on the non-cancer and cancer evaluations, carcinogenic PAHs in soil were identified as the risk drivers (i.e., contaminants with non-cancer hazard quotients greater than 1.0 or with cancer risks greater than $1x10^{-6}$ in a scenario and medium with total cancer risks greater than $1x10^{-4}$) in the risk characterization.

Risk Drivers – Uncertainty Analysis

Based on the non-cancer and cancer evaluations, carcinogenic PAHs in soil were identified as the risk drivers (i.e., contaminants with non-cancer hazard quotients greater than 1.0 or with cancer risks greater than $1x10^{-6}$ in a scenario and medium with total cancer risks greater than $1x10^{-4}$) in the uncertainty analysis.

TABLE 6-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING UNWEIGHTED EPCS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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 Users	Surface Soil	Incidental Ingestion	2E-05	--	Benzo(a)pyrene	Dibenzo(a,h)anthracene	--	--
		Dermal Contact	2E-05	--	--	Benzo(a)pyrene	--	--
		Inhalation	1E-11	--	--	--	--	--
		Total	4E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	1E-03	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	0.13	--
		Dermal Contact	9E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	0.08	--
		Inhalation	5E-07	--	--	--	0.05	--
		Total	2E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	0.27	--
	Receptor Total		**2E-03**				**0.3**	
Adult Recreational Users	Surface Soil	Incidental Ingestion	2E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	2E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	7E-12	--	--	--	--	--
		Total	4E-06	--	--	Benzo(a)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	9E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	0.008	--
		Dermal Contact	9E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	0.007	--
		Inhalation	1E-06	--	--	--	0.03	--
		Total	2E-04	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	0.04	--
	Receptor Total		**2E-04**				**0.04**	

TABLE 6-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING UNWEIGHTED EPCS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Lifetime Recreational Users (Child + Adult)	Surface Soil	Incidental Ingestion	3E-05	--	Benzo(a)pyrene	Dibenzo(a,h)anthracene	--	--
		Dermal Contact	2E-05	--	Benzo(a)pyrene	--	--	--
		Inhalation	2E-11	--	--	--	--	--
		Total	5E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	1E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	NA	--
		Dermal Contact	9E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	NA	--
		Inhalation	1E-06	--	--	--	NA	--
		Total	2E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	NA	--
	Receptor Total		**2E-03**				**NA**	
Construction Workers	Surface Soil	Incidental Ingestion	8E-07	--	--	--	--	--
		Dermal Contact	3E-07	--	--	--	--	--
		Inhalation	1E-12	--	--	--	--	--
		Total	1E-06	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	4E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	0.1	--
		Dermal Contact	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	0.05	--
		Inhalation	2E-06	--	--	--	0.8	--
		Total	6E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	1.0	--
	Receptor Total		**6E-05**				**1**	
Occupational Workers	Surface Soil	Incidental Ingestion	1E-05	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	9E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	4E-11	--	--	--	--	--
		Total	2E-05	--	Benzo(a)pyrene	--	--	--

TABLE 6-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING UNWEIGHTED EPCS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Occupational Workers	Subsurface Soil	Incidental Ingestion	5E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.07	--
		Dermal Contact	4E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.05	--
		Inhalation	1E-05	--	--	Naphthalene	0.3	--
		Total	9E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene, Naphthalene	0.4	--
	Receptor Total		**9E-04**				**0.4**	
Child Residents (0-6 years)	Surface Soil	Incidental Ingestion	2E-04	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Dermal Contact	6E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Inhalation	2E-10	--	--	--	--	--
		Total	2E-04	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(a)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	8E-03	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	Chrysene	0.9	--
		Dermal Contact	3E-03	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene, Chrysene	0.3	--
		Inhalation	1E-05	--	--	Naphthalene	1	--
		Total	1E-02	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	Chrysene, Naphthalene	2	Target Organ HIs < 1
	Receptor Total		**1E-02**				**2**	

TABLE 6-1

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING UNWEIGHTED EPCS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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 Residents (6-30 years)	Surface Soil	Incidental Ingestion	2E-05	--	Benzo(a)pyrene	Dibenzo(a,h)anthracene	--	--
		Dermal Contact	1E-05	--	--	Benzo(a)pyrene	--	--
		Inhalation	3E-10	--	--	--	--	--
		Total	4E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	1E-03	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	0.10	--
		Dermal Contact	6E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	0.04	--
		Inhalation	4E-05	--	Naphthalene	--	1	--
Adult Residents (6-30 years)	Subsurface Soil	**Total**	2E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene, Naphthalene	Benzo(k)fluoranthene	1	--
	Receptor Total		**2E-03**				**1**	
Lifetime Residents (Child + Adult)	Surface Soil	Incidental Ingestion	2E-04	Benzo(a)pyrene	--	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Dermal Contact	7E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Inhalation	5E-10	--	--	--	--	--
		Total	3E-04	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(k)fluoranthene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	9E-03	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	Chrysene	NA	--
		Dermal Contact	4E-03	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene, Chrysene	NA	--
		Inhalation	5E-05	--	Naphthalene	--	NA	--
		Total	1E-02	Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene, Naphthalene	Chrysene	NA	--
	Receptor Total		**1E-02**				**NA**	

*** CTE risks are presented in Appendix C.**

TABLE 6-2

RISK SUMMARY TABLE USING UNWEIGHTED EPCs
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Current/Future Child Recreational User	SS	4E-05	- -	- -	- -	- -	- -	- -
	SB	2E-03	Benzo(a)pyrene	140	0.3	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Benzo(k)fluoranthene	44				
			Dibenzo(a,h)anthracene	23				
			Indeno (1,2,3-cd)pyrene	53				
Current/Future Adult Recreational User	SS	4E-06	- -	- -	- -	- -	- -	- -
	SB	2E-04	Benzo(a)pyrene	140	0.04	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Dibenzo(a,h)anthracene	23				
			Indeno(1,2,3-cd)pyrene	53				
Current/Future Lifetime Recreational User	SS	5E-05	- -	- -	NA	- -	- -	- -
	SB	2E-03	Benzo(a)pyrene	140	NA	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Benzo(k)fluoranthene	44				
			Dibenzo(a,h)anthracene	23				
			Indeno (1,2,3-cd)pyrene	53				
Current/Future Construction Worker	SS	1E-06	- -	- -	- -	- -	- -	- -
	SB	6E-05	Benzo(a)pyrene	140	1.0	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Dibenzo(a,h)anthracene	23				

TABLE 6-2

RISK SUMMARY TABLE USING UNWEIGHTED EPCs
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Current/Future Occupational Workers	SS	2E-05	- -	- -	- -	- -	- -	- -
	SB	9E-04	Benzo(a)pyrene	140	0.4	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Benzo(k)fluoranthene	44				
			Dibenzo(a,h)anthracene	23				
			Indeno (1,2,3-cd)pyrene	53				
			Naphthalene	190				
Future Child Resident	SS	2E-04	Benzo(a)pyrene	3.3	- -	- -	- -	- -
			Benzo(a)anthracene	2				
			Dibenzo(a,h)anthracene	0.3				
			Indeno (1,2,3-cd)pyrene	1.5				
	SB	1E-02	Benzo(a)pyrene	140	2.0	No individual target organ HI is > 1	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Benzo(k)fluoranthene	44				
			Chrysene	130				
			Dibenzo(a,h)anthracene	23				
			Indeno (1,2,3-cd)pyrene	53				
			Naphthalene	190				

TABLE 6-2

RISK SUMMARY TABLE USING UNWEIGHTED EPCs
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Future Adult Resident	SS	4E-05	- -	- -	- -	- -	- -	- -
	SB	2E-03	Benzo(a)pyrene	140	1.0	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Benzo(k)fluoranthene	44				
			Dibenzo(a,h)anthracene	23				
			Indeno (1,2,3-cd)pyrene	53				
			Naphthalene	190				
Future Lifetime Resident (Child + Adult)	SS	3E-04	Benzo(a)pyrene	3.3	NA	- -	- -	- -
			Benzo(a)anthracene	2				
			Dibenzo(a,h)anthracene	0.3				
			Indeno (1,2,3-cd)pyrene	1.5				
	SB	1E-02	Benzo(a)pyrene	140	NA	- -	- -	- -
			Benzo(a)anthracene	130				
			Benzo(b)fluoranthene	110				
			Benzo(k)fluoranthene	44				
			Chrysene	130				
			Dibenzo(a,h)anthracene	23				
			Indeno (1,2,3-cd)pyrene	53				
			Naphthalene	190				

All ILCRs and HIs are values for the RME scenario.

Acryomns
EPC = Exposure Point Concentration
HI = Hazard Index
HQ = Hazard Quotient
ILCR = Incremental Lifetime Cancer Risk
NA = Not Applicable
SB = Subsurface Soil
SS = Surface Soil
TS = Target System

*** CTE risks are presented in Appendix C.**

Footnotes
1 - COCs are presented for receptors with a total RME ILCR greater than 1E-4 or target organ HI greater than 1. COC is any carcinogenic chemical with an individual ILCR greater than 1E-6 or a noncarcinogenic chemical contributing to target organ HI greater than 1.0.
2 - Lifetime risks are not calculated for noncancer risks because those risks are not additive.

TABLE 6-3

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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 Users	Surface Soil	Incidental Ingestion	8E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	6E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	3E-12	--	--	--	--	--
		Total	1E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	--	--
	Subsurface Soil	Incidental Ingestion	2E-04	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	0.03	--
		Dermal Contact	2E-04	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	0.02	--
		Inhalation	6E-08	--	--	--	0.007	--
		Total	4E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.06	--
	Receptor Total		**4E-04**				**0.06**	
Adult Recreational Users	Surface Soil	Incidental Ingestion	6E-07	--	--	--	--	--
		Dermal Contact	6E-07	--	--	--	--	--
		Inhalation	2E-12	--	--	--	--	--
		Total	1E-06	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	0.002	--
		Dermal Contact	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	0.001	--
		Inhalation	1E-07	--	--	--	0.004	--
		Total	3E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	0.007	--
	Receptor Total		**3E-05**				**0.007**	

TABLE 6-3

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Lifetime Recreational Users (Child + Adult)	Surface Soil	Incidental Ingestion	8E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	6E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	6E-12	--	--	--	--	--
		Total	1E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	--	--
	Subsurface Soil	Incidental Ingestion	2E-04	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene	Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	NA	--
		Dermal Contact	2E-04	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	NA	--
		Inhalation	2E-07	--	--	--	NA	--
		Total	4E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	NA	--
	Receptor Total		**4E-04**				**NA**	
Construction Workers	Surface Soil	Incidental Ingestion	3E-07	--	--	--	--	--
		Dermal Contact	1E-07	--	--	--	--	--
		Inhalation	2E-09	--	--	--	--	--
		Total	4E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	7E-06	--	--	Benzo(a)pyrene	0.03	--
		Dermal Contact	3E-06	--	--	Benzo(a)pyrene	0.01	--
		Inhalation	2E-07	--	--	--	0.12	--
		Total	1E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	0.16	--
	Receptor Total		**1E-05**				**0.2**	
Occupational Workers	Surface Soil	Incidental Ingestion	4E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	3E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	1E-11	--	--	--	--	--
		Total	7E-06	--	--	Benzo(a)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	1E-04	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	0.02	--
		Dermal Contact	1E-04	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	0.01	--
		Inhalation	1E-06	--	--	Naphthalene	0.04	--
		Total	3E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene, Naphthalene	0.07	--
	Receptor Total		**3E-04**				**0.07**	

TABLE 6-3

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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 Residents (0-6 years)	Surface Soil	Incidental Ingestion	5E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Dermal Contact	2E-05	--	--	Benzo(a)anthracene, Benzo(a)pyrene, Dibenzo(a,h)anthracene	--	--
		Inhalation	7E-11	--	--	--	--	--
		Total	7E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	1E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	0.23	--
		Dermal Contact	5E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.06	--
		Inhalation	1E-06	--	--	--	0.15	--
		Total	2E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	0.44	--
	Receptor Total		**2E-03**				**0.4**	
Adult Residents (6-30 years)	Surface Soil	Incidental Ingestion	8E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	4E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	1E-10	--	--	--	--	--
		Total	1E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	--	--
	Subsurface Soil	Incidental Ingestion	2E-04	Benzo(a)pyrene	Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	0.02	--
		Dermal Contact	1E-04	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	0.009	--
		Inhalation	5E-06	--	--	Naphthalene	0.2	--
		Total	3E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene, Naphthalene	0.2	--
	Receptor Total		**3E-04**				**0.2**	

TABLE 6-3

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Lifetime Residents (Child + Adult)	Surface Soil	Incidental Ingestion	6E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Dermal Contact	2E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene	--	--
		Inhalation	2E-10	--	--	--	--	--
		Total	9E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	2E-03	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	NA	--
		Dermal Contact	7E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene	NA	--
		Inhalation	7E-06	--	--	Naphthalene	NA	--
		Total	2E-03	Benzo(a)anthracene, Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	Benzo(k)fluoranthene, Chrysene, Naphthalene	NA	--
	Receptor Total		**2E-03**				**NA**	

*** CTE risks are presented in Appendix C.**

TABLE 6-4

RISK SUMMARY TABLE USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Current/Future Child Recreational User	SS	1.0E-05	- -	- -	- -	- -	- -	- -
	SB	4.0E-04	Benzo(a)pyrene	25	0.06	- -	- -	- -
			Benzo(a)anthracene	23				
			Benzo(b)fluoranthene	20				
			Dibenzo(a,h)anthracene	4.3		- -	- -	- -
			Indeno(1,2,3-cd)pyrene	9.6				
Current/Future Adult Recreational User	SS	1.0E-06	- -	- -	- -	- -	- -	- -
	SB	3.0E-05	- -	- -	0.007	- -	- -	- -
Current/Future Lifetime Recreational User	SS	1.0E-05	- -	- -	NA	- -	- -	- -
	SB	4.0E-04	Benzo(a)pyrene	25	NA	- -	- -	- -
			Benzo(a)anthracene	23				
			Benzo(b)fluoranthene	20				
			Dibenzo(a,h)anthracene	4.3				
			Indeno(1,2,3-cd)pyrene	9.6				
Current/Future Construction Worker	SS	4.0E-07	- -	- -	- -	- -	- -	- -
	SB	1.0E-05	- -	- -	0.2	- -	- -	- -

TABLE 6-4

RISK SUMMARY TABLE USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Current/Future Occupational Workers	SS	7.0E-06	- -	- -	- -	- -	- -	- -
	SB	3.0E-04	Benzo(a)pyrene	25	0.07	- -	- -	- -
			Benzo(a)anthracene	23				
			Benzo(b)fluoranthene	20				
			Dibenzo(a,h)anthracene	4.3				
			Indeno(1,2,3-cd)pyrene	9.6				
			Naphthalene	26				
Future Child Resident	SS	7.0E-05	- -	- -	- -	- -	- -	- -
	SB	2.0E-03	Benzo(a)pyrene	25	0.4	- -	- -	- -
			Benzo(a)anthracene	23				
			Benzo(b)fluoranthene	20				
			Benzo(k)fluoranthene	8.2				
			Dibenzo(a,h)anthracene	4.3				
			Indeno(1,2,3-cd)pyrene	9.6				
Future Adult Resident	SS	1.0E-05	- -	- -	- -	- -	- -	- -
	SB	3.0E-04	Benzo(a)pyrene	25	0.2	- -	- -	- -
			Benzo(a)anthracene	23				
			Benzo(b)fluoranthene	20				
			Dibenzo(a,h)anthracene	4.3				
			Indeno(1,2,3-cd)pyrene	9.6				
			Naphthalene	26				

TABLE 6-4

RISK SUMMARY TABLE USING EPCs WEIGHTED 90% EXCAVATED AREA AND 10% UNEXCAVATED AREA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Future Lifetime Resident (Child + Adult)	SS	9.0E-05	- -	- -	NA	- -	- -	- -
	SB	2.0E-03	Benzo(a)pyrene	25	NA	- -	- -	- -
			Benzo(a)anthracene	23				
			Benzo(b)fluoranthene	20				
			Benzo(k)fluoranthene	8.2				
			Chrysene	23				
			Dibenzo(a,h)anthracene	4.3				
			Indeno(1,2,3-cd)pyrene	9.6				
			Naphthalene	26				

All ILCRs and HIs are values for the RME scenario.

Acryomns
HI = Hazard Index
HQ = Hazard Quotient
ILCR = Incremental Lifetime Cancer Risk
NA = Not Applicable
SB = Subsurface Soil
SS = Surface Soil
TS = Target System

Footnotes
1 - COCs are presented for receptors with a total RME ILCR greater than 1E-4 or target organ HI greater than 1. COC is any carcinogenic chemical with an individual ILCR greater than 1E-6 or a noncarcinogenic chemical contributing to target organ HI greater than 1.0.
2 - Lifetime risks are not calculated for noncancer risks because those risks are not additive.

***CTE risks are presented in Appendix C.**

TABLE 6-5

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 5% FOR SOILS CONTAINING ASH/BURNT MATERIAL AND 95% FOR REMAINING SITE SOILS
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Child Recreational Users	Surface Soil	Incidental Ingestion	6E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	5E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	3E-12	--	--	--	--	--
		Total	1E-05	--	--	Benzo(a)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	4E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	0.01	--
		Dermal Contact	3E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	0.006	--
		Inhalation	1E-08	--	--	--	0.001	--
		Total	7E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibeno(a,h)anthracene, Indeno(1,2,3-cd)pyrene	0.02	--
	Receptor Total		**8E-05**				**0.02**	
Adult Recreational Users	Surface Soil	Incidental Ingestion	5E-07	--	--	--	--	--
		Dermal Contact	5E-07	--	--	--	--	--
		Inhalation	2E-12	--	--	--	--	--
		Total	1E-06	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	3E-06	--	--	Benzo(a)pyrene	0.0007	--
		Dermal Contact	3E-06	--	--	Benzo(a)pyrene	0.0005	--
		Inhalation	3E-08	--	--	--	0.0007	--
		Total	7E-06	--	--	Benzo(a)pyrene	0.002	--
	Receptor Total		**8E-06**				**0.002**	

TABLE 6-5

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 5% FOR SOILS CONTAINING ASH/BURNT MATERIAL AND 95% FOR REMAINING SITE SOILS
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Lifetime Recreational Users (Child + Adult)	Surface Soil	Incidental Ingestion	7E-06	--	--	Benzo(a)pyrene	NA	NA
		Dermal Contact	5E-06	--	--	Benzo(a)pyrene	NA	NA
		Inhalation	5E-12	--	--	--	NA	NA
		Total	1E-05	--	--	Benzo(a)pyrene	NA	NA
	Subsurface Soil	Incidental Ingestion	5E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	NA	NA
		Dermal Contact	3E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	NA	NA
		Inhalation	4E-08	--	--	--	NA	NA
		Total	8E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	NA	NA
	Receptor Total		**9E-05**				**NA**	
Construction Worker	Surface Soil	Incidental Ingestion	2E-07	--	--	--	--	--
		Dermal Contact	8E-08	--	--	--	--	--
		Inhalation	2E-09	--	--	--	--	--
		Total	3E-07	--	--	--	--	--
	Subsurface Soil	Incidental Ingestion	1E-06	--	--	--	0.012	--
		Dermal Contact	5E-07	--	--	--	0.004	--
		Inhalation	4E-08	--	--	--	0.022	--
		Total	2E-06	--	--	--	0.038	--
	Receptor Total		**2E-06**				**0.04**	

TABLE 6-5

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 5% FOR SOILS CONTAINING ASH/BURNT MATERIAL AND 95% FOR REMAINING SITE SOILS
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Occupational Workers	Surface Soil	Incidental Ingestion	3E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	2E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	1E-11	--	--	--	--	--
		Total	5E-06	--	--	Benzo(a)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	0.01	--
		Dermal Contact	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	0.004	--
		Inhalation	3E-07	--	--	--	0.01	--
		Total	3E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	0.02	--
	Receptor Total		**4E-05**				**0.02**	
Child Residents (0-6 years)	Surface Soil	Incidental Ingestion	4E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
		Dermal Contact	2E-05	--	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	--	--
		Inhalation	6E-11	--	--	--	--	--
		Total	6E-05	--	Benzo(a)pyrene	Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	--	--
	Subsurface Soil	Incidental Ingestion	3E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.1	--
		Dermal Contact	1E-04	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	0.02	--
		Inhalation	3E-07	--	--	--	0.03	--
		Total	4E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.1	--
	Receptor Total		**5E-04**				**0.1**	

TABLE 6-5

SUMMARY OF CANCER RISKS AND HAZARD INDICES
REASONABLE MAXIMUM EXPOSURES USING EPCs WEIGHTED 5% FOR SOILS CONTAINING ASH/BURNT MATERIAL AND 95% FOR REMAINING SITE SOILS
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
Adult Residents (6-30 years)	Surface Soil	Incidental Ingestion	7E-06	--	--	Benzo(a)pyrene	--	--
		Dermal Contact	3E-06	--	--	Benzo(a)pyrene	--	--
		Inhalation	8E-11	--	--	--	--	--
		Total	1E-05	--	--	Benzo(a)pyrene	--	--
Adult Residents (6-30 years)	Subsurface Soil	Incidental Ingestion	4E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	0.009	--
		Dermal Contact	2E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene	0.003	--
		Inhalation	1E-06	--	--	--	0.03	--
		Total	7E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	0.04	--
	Receptor Total		**8E-05**				**0.04**	
Lifetime Residents (Child + Adult)	Surface Soil	Incidental Ingestion	5E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	NA	--
		Dermal Contact	2E-05	--	--	Benzo(a)anthracene, Benzo(a)pyrene, Dibenzo(a,h)anthracene	NA	--
		Inhalation	1E-10	--	--	--	NA	--
		Total	7E-05	--	Benzo(a)pyrene	Benzo(a)anthracene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene	NA	--
	Subsurface Soil	Incidental Ingestion	3E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	NA	--
		Dermal Contact	1E-04	--	Benzo(a)pyrene, Dibenzo(a,h)anthracene	Benzo(a)anthracene, Benzo(b)fluoranthene, Indeno(1,2,3-cd)pyrene	NA	--
		Inhalation	1E-06	--	--	--	NA	--
		Total	5E-04	Benzo(a)pyrene	Benzo(a)anthracene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	NA	--
	Receptor Total		**5E-04**				**NA**	

*** CTE risks are presented in Appendix C.**

TABLE 6-6

RISK SUMMARY TABLE USING EPCs WEIGHTED 5% FOR SOILS WITH ASH/BURNT MATERIAL AND 95% FOR REMAINING SITE SOILS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Current/Future Child Recreational User	SS	1E-05	- -	- -	- -	- -	- -	- -
	SB	7E-05	- -	- -	0.02	- -	- -	- -
Current/Future Adult Recreational User	SS	1E-06	- -	- -	- -	- -	- -	- -
	SB	7E-06	- -	- -	0.002	- -	- -	- -
Current/Future Lifetime Recreational User	SS	1E-05	- -	- -	NA	- -	- -	- -
	SB	8E-05	- -	- -	NA	- -	- -	- -
Current/Future Construction Worker	SS	3E-07	- -	- -	- -	- -	- -	- -
	SB	2E-06	- -	- -	0.04	- -	- -	- -
Current/Future Occupational Workers	SS	5E-06	- -	- -	- -	- -	- -	- -
	SB	3E-05	- -	- -	0.02	- -	- -	- -
Future Child Resident	SS	6E-05	- -	- -	- -	- -	- -	- -
	SB	4E-04	Benzo(a)pyrene	5.0	0.1	- -	- -	- -
			Benzo(a)anthracene	4.7				
			Benzo(b)fluoranthene	4.1				
			Dibenzo(a,h)anthracene	0.87				
			Indeno (1,2,3-cd)pyrene	2.0				
Future Adult Resident	SS	1E-05	- -	- -	- -	- -	- -	- -
	SB	7E-05	- -	- -	0.04	- -	- -	- -

TABLE 6-6

RISK SUMMARY TABLE USING EPCs WEIGHTED 5% FOR SOILS WITH ASH/BURNT MATERIAL AND 95% FOR REMAINING SITE SOILS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Receptor	Exposed Matrix	ILCR	Chemical of Concern[1]	EPC (mg/kg)	HI[2]	Chemical of Concern[1]	Target System	EPC (mg/kg)
Future Lifetime Resident (Child + Adult)	SS	7E-05	- -	- -	NA	- -	- -	- -
	SB	5E-04	Benzo(a)pyrene	5.0	NA	- -	- -	- -
			Benzo(a)anthracene	4.7				
			Benzo(b)fluoranthene	4.1				
			Dibenzo(a,h)anthracene	0.87				
			Indeno (1,2,3-cd)pyrene	2.0				

All ILCRs and HIs are values for the RME scenario.

Acryomns
EPC = Exposure Point Concentration
HI = Hazard Index
HQ = Hazard Quotient
ILCR = Incremental Lifetime Cancer Risk
NA = Not Applicable
SB = Subsurface Soil
SS = Surface Soil
TS = Target System

Footnotes
1 - COCs are presented for receptors with a total RME ILCR greater than 1E-4 or target organ HI greater than 1. COC is any carcinogenic chemical with an individual ILCR greater than 1E-6 or a noncarcinogenic chemical contributing to target organ HI greater than 1.0.
2 - Lifetime risks are not calculated for noncancer risks because those risks are not additive.

*** CTE risks are presented in Appendix C.**

7.0 SUMMARY AND CONCLUSIONS

This section summarizes the findings of the RI and provides conclusions and recommendations for OU9.

7.1 SUMMARY

The following provides a summary of the nature and extent of contamination, fate and transport of contamination, and the results of the human health risk assessment for OU9.

7.1.1 Nature and Extent of Contamination

The discussion of the nature and extent of contamination at OU9 focuses on the distribution of chemical concentrations across OU9 with consideration of site uses and geological conditions. Soil was the matrix of interest investigated for the OU9 RI.

PAHs and inorganics were detected in surface soil and subsurface soil at OU9. Concentrations in subsurface soil were generally greater than in the surface soil, especially for PAHs. Most locations had PAH concentrations greater than residential risk-based screening levels, whereas for metals, most locations had concentrations less than residential risk-based screening levels. Surface soil concentrations of antimony, lead, mercury, and PAHs indicated that contamination was sufficiently removed during the 2007 removal action in the excavated area and that the unexcavated area was not adversely impacted by past contaminant releases at OU9. In subsurface soil, PAH contamination is present in the unexcavated area associated with ash/burnt material, which represents a small portion of site soil (approximately 5 percent) based on an evaluation of geological conditions (presented in Appendix A.1). PAH subsurface soil concentrations in the unexcavated area indicate that subsurface soil in that area has not been adversely affected by OU9 releases because only very minor amounts of ash/burnt material were found there. Antimony, lead, and mercury concentrations in subsurface soil for both the excavated and unexcavated areas indicate that subsurface soil was not adversely affected due to those contaminants from past OU9 releases. In summary, contamination in excess of acceptable risk ranges at OU9 is due to PAHs in subsurface soil associated with small isolated pockets of burnt material/ash.

7.1.2 Fate and Transport of Contaminants

The site surface is mostly covered with asphalt/pavement or buildings, limiting mobilization of contaminants through surface water runoff or infiltration of precipitation. The majority of contamination was removed from the site in 2007, and remaining contamination is not subject to erosion. No overburden groundwater is present at OU9, and all contamination is within the unsaturated overburden

material; therefore, subsurface soil does not contact groundwater. Contamination is not expected in bedrock groundwater because the site contaminants (PAHs) present in subsurface soil located above the bedrock have relatively low water solubilities and tend to bind to soil particles rendering them immobile. Only a small portion of OU9 is covered with flora, so herbivore exposure to contamination from feeding on the vegetation is not a concern.

The fate and transport of PAHs and inorganic contaminant (i.e., lead and mercury) are controlled at OU9 mainly by the mobility of soil particles. PAHs are generally considered to be fairly immobile but persistent chemicals in the environment that generally do not migrate vertically to a great extent in soil, and site data indicate that is the case at OU9. Instead, they are more likely to adhere to soil particles and be removed from the site via surface water runoff and erosional processes, especially when no pavement is present or if erosion controls are not present or functioning properly. Metals do not undergo any of the degradation reactions that most organic chemicals do; therefore, they are considered to be persistent. The major fate mechanisms for metals are adsorption to the soil matrix and bioaccumulation. The major transport mechanism of OU9 contaminant is soil erosion and surface water runoff; however, because most of the site contamination was removed, offsite migration of remaining contamination in the subsurface is not expected under current or future site conditions.

7.1.3 Risk Assessment

As discussed in Section 6.0, analytical data for soil were used in the human health risk assessment for OU9. The receptors evaluated include current and future adult, child, and lifetime recreational users, hypothetical future adult, child, and lifetime residents, current and future occupational workers (e.g., typical industrial/commercial workers performing routine activities), and current and future construction workers (e.g., remediation and excavation). The exposure routes include ingestion, dermal contact, and inhalation of air/dust particulates/vapors from soil. Ingestion of and dermal contact with groundwater were not evaluated because no overburden groundwater is present at OU9.

The human health risk assessment evaluated potential risks under current land use conditions and potential future land use conditions for the entire site under three different EPC scenarios. The first set of EPCs calculated were not weighted (most conservative method and included in the report to assist with risk management decisions), the second set were weighted 90 percent for the excavated area and 10 percent for the unexcavated area (per the OU9 RI SAP), and the third set were calculated by weighting site soil containing ash/burnt material at 5 percent and remaining site soil at 95 percent (most representative of site conditions based on the CSM). Risks were calculated for these three EPC scenarios to assist with risk management decisions; however, risks calculated based on 5 percent ash/burnt material and 95 percent remaining site soil EPCs are the most representative of potential site

risks based on the most representative site conditions. Any unacceptable risks calculated are due to carcinogenic PAHs.

Potentially unacceptable non-carcinogenic health impacts are not anticipated for any of the receptors under any of the risk evaluations conducted because all calculated target organ/system HIs were less than or equal to 1.

RME and CTE cancer risk estimates for current and future recreational users and occupational workers exposed to surface soil and construction workers exposed to surface and subsurface soil evaluated are less than or within the USEPA target cancer risk range for all risk evaluations performed. For the unweighted EPC RME risk evaluation surface soil cancer risk estimates for the child resident (2×10^{-4}) and the lifetime resident (3×10^{-4}) exceed the USEPA target cancer risk range. The RME surface soil cancer risk estimates for the adult resident and the CTE surface soil cancer risk estimates for all residents do not exceed the USEPA target cancer risk range. For the unweighted EPC RME surface soil risk evaluation, cancer risks for child (2×10^{-4}), adult (4×10^{-5}) and lifetime residents (3×10^{-4}) as well as child recreational users (4×10^{-5}), lifetime recreational users (5×10^{-5}), and occupational workers (2×10^{-5}), exceed the State of Maine cancer risk guideline. The construction worker (6×10^{-5}) exposed to subsurface soil under the RME scenario also exceeded the State of Maine cancer risk guideline. CTE cancer risks for child residents (3×10^{-5}) exposed to surface soil also exceeded the State of Maine risk guideline but did not exceed the USEPA target cancer risk range.

For the 90 percent excavated area and 10 percent unexcavated area weighted EPC risk evaluation, RME cancer risks for child residents (7×10^{-5}) and lifetime residents (9×10^{-5}) exposed to surface soil exceed the State of Maine risk guideline of 1×10^{-5}. RME carcinogenic surface soil risks for occupational, recreation and residential receptors did not exceed the USEPA cancer risk range. Neither did the construction worker exposed to surface and subsurface soil. CTE risks do not exceed the USEPA or State of Maine risk guidelines for any receptor evaluated in the risk characterization (i.e. construction worker exposed to surface and subsurface soil, and occupational, recreational, and residential receptors exposed to surface soil).

For the 5 percent soil containing ash/burnt material and 95 percent remaining soil weighted EPC risk evaluation, RME cancer risks for child residents (6×10^{-5}) and lifetime residents (7×10^{-5}) exposed to surface soil exceed the State of Maine risk guideline of 1×10^{-5}. None of the receptors evaluated under the RME scenario for risk characterization exceeded the USEPA target cancer risk range. CTE cancer risks do not exceed the State of Maine or USEPA cancer risk guidelines for any receptor evaluated for the risk characterization.

Lead was not selected as a COPC for surface or subsurface soil because the background evaluation (Appendix B) found OU9 lead concentrations to be within facility background levels. However, lead risks were evaluated as part of the background risk evaluation. Results of the lead evaluation indicate that adverse effects are not anticipated for any of the receptors exposed to lead in soil in the study area.

Potential risks to occupational, recreational, and residential exposure for subsurface soil that could be excavated and brought to the surface were evaluated as part of the uncertainty analysis. No non-carcinogenic subsurface soil risks exceeded an individual target organ HI greater than 1; therefore, no non-carcinogenic adverse effects are anticipated. Subsurface soil cancer risks would exceed the USEPA target cancer risk range for all receptors except the construction worker for the unweighted scenario. Occupational workers, recreational users (child and lifetime), and all residential receptors would exceed the USEPA target cancer risk range under the 90-percent excavated and 10-percent unexcavated weighted EPC evaluation. Cancer risks would exceed the USEPA target cancer risk range for child and lifetime residents under the 5 percent soil containing ash/burnt material and 95 percent remaining soil weighted EPC risk evaluation. The main risk contributors are carcinogenic PAHs.

The site is currently and has historically been located within an industrial area of PNS, and no ecological habitat has been identified at the site. Therefore, there are no onshore concerns for ecological risk. Offshore concerns for ecological receptors are being addressed as part of OU4.

7.2 CONCLUSIONS AND RECOMMENDATIONS

Based on evaluation of the nature and extent of contamination, fate and transport of contaminants, and site risks, conclusions and recommendations were identified as described in the following sections.

7.2.1 Conclusions

The nature and extent of contamination in soil at OU9 has been sufficiently defined to support the FS. Potentially unacceptable risks (based on the USEPA target risk range and the all of the EPC risk evaluations) were estimated for child and lifetime residents (RME scenario) exposed to surface soil based on the unweighted risk evaluations; however, no unacceptable risks were estimated for surface soil in the 90-percent excavated area and 10-percent unexcavated area weighted EPC risk evaluation or the 5 percent soil containing ash/burnt material and 95 percent remaining soil weighted EPC risk evaluation. Potentially unacceptable risks were estimated for all receptors exposed to subsurface soil (RME scenario) except the construction worker for the unweighted EPC risk evaluations, and all receptors except the construction worker and adult recreational user for the 90-percent excavated 10-percent unexcavated EPC risk evaluations. The child and lifetime residents exposed to subsurface soil (RME scenario) were the only receptors with cancer risks greater than the USEPA target risk range under the 5 percent soil

containing ash/burnt material and 95 percent remaining soil weighted EPC risk evaluation. The 5 percent soil containing ash/burnt material and 95 percent remaining soil weighted EPC risk evaluation is considered the most representative of site conditions. The main chemicals contributing to risk are carcinogenic PAHs. Based on the risk evaluation, subsurface soil is a potential medium of concern for OU9.

7.2.2 Recommendations

The Navy recommends that the FS Report for OU9 be prepared to address potentially unacceptable human health risks posed by exposure to carcinogenic PAHs in subsurface soil. The Navy recommends that remedial action objectives be developed for the portion of OU9 (subsurface soil) that potentially poses unacceptable risks to future hypothetical residents.

REFERENCES

Answers.com, June 2008. Website information on Portsmouth, New Hampshire related to geography, climate, and economy. Website accessed in June 2008.

ATSDR (Agency for Toxic Substances and Disease Registry), October 1989. Draft Toxicological Profile for Polycyclic Aromatic Hydrocarbons. Atlanta, Georgia.

ATSDR, March 1999. Toxicological Profile for Mercury. Atlanta, Georgia.

ATSDR, August 2007. Toxicological Profile for Lead. Atlanta, Georgia.

ATSDR, September 2008. Toxicological Profiles, United States Department (http://www.atsdr.ced.gov/toxpro2.html#1).

FEMA (Federal Emergency Management Agency, July 1986. Flood Insurance Rate Map for the Town of Kittery, Maine, York County, Community-Panel Number 230171 0005 and 0008.

FWENC (Foster Wheeler Environmental Corporation), April 1999. Contractor's Final Report for Ash Contaminated Soil Excavation at Building 62, Portsmouth Naval Shipyard, Kittery, Maine. FWENC, Langhorne, Pennsylvania.

Halliburton NUS, November 1995. RCRA Facilities Investigation (RFI) Data Gap Report (Final) for Portsmouth Naval Shipyard, Kittery, Maine. Halliburton NUS Corporation, Wayne, Pennsylvania.

Hong and Luthy, 2007. Availability of Polycyclic Aromatic Hydrocarbons From Lampblack Impacted Soils at Former Oil-Gas Plant Sites in California, USA. Environmental Toxicology and Chemistry, Vol 26, No.3, pp. 394-405, 2007.

Louis Berger Group, Inc., April 2003. Cultural Resources Survey for Portsmouth Naval Shipyard, Kittery, Maine. Louis Berger Group, Inc., East Orange, New Jersey.

Maine DMR (Department of Marine Resources), August 2008. Notice of Emergency Rule-Making for Bacterial Closures for Shellfish Pollution Area Inventory, Area 1 – Piscataqua River (Kittery, Eliot, South Berwick) and Area 2A – Portsmouth Harbor and vicinity (Kittery) and Isle of Shoal. Effective Date August 28, 2008. Maine Department of Marine Resources.

Maine Fisheries and Wildlife, January 1989. Significant Fish and Wildlife Resources of Coastal York County Maine. Prepared by Maine Department of Inland Fisheries and Wildlife, Augusta, Maine.

Maine Department of Environmental Protection and Center for Disease Control, July 2009. Guidance for HHRAs for Hazardous Substance Sites in Maine. DEP-BRWM 2B 2009.

McLauren/Hart, July 1992. Draft RCRA Facility Investigation Report Portsmouth Naval Shipyard, Kittery, Maine, McLaren/Hart Environmental Engineering Corporation, Albany, New York.

McLaren/Hart, March 1994. Public Health and Environmental Risk Evaluation Part A: Human Health Risk Assessment, Portsmouth Naval Shipyard, Kittery, Maine. McLaren/Hart Environmental Engineering Corporation, Albany, New York.

Navy, February 2006. Action Memorandum for Site 34, Portsmouth Naval Shipyard, Kittery, Maine. [Dated 2006 and signed in 2007.]

Navy, August 2006. Navy Environmental Restoration Program (NERP) Manual, Chapter 8, Remedial Investigation/Feasibility Study.

Navy, December 2008. U.S. Navy Human Health Risk Assessment Guidance.

Navy, June 2011. FY12 Amended Site Management Plan for Portsmouth Naval Shipyard Kittery, Maine.

NFEC (Navy Facilities Engineering Command), August 1993. Natural Resources Management Plan for Portsmouth Naval Shipyard, Kittery, Maine. Naval Facilities Engineering Command, Northern Division, Natural Resources Management Branch, Planning Division, Philadelphia, PA, and Environmental Affairs, Portsmouth Naval Shipyard, Kittery, Maine.

NHDES (New Hampshire Department of Environmental Services), June 2006. NHDES Shellfish Program 2005 Annual Report (http://www.des.state.nh.us/WMB/Shellfish/2005AnnualReport/).

NOAA, January 2007. National Climatic Data Center Office of NOAA (www.ncdc.noaa.gov/oa/climate/research/cag3/cag3.html) for the Portland Maine weather station. Data from 1975 to 2006, updated in January 2007.

PNS, October 1996. Industrial History of Building 62 (Former Gas Manufacturing Plant), prepared for the Environmental Affairs Office, Portsmouth Naval Shipyard, Portsmouth, New Hampshire, by J. Dolph (Environmental Research Specialist) and LCDR Dennis Turpin, USNR (Research Assistant).

PNS, February 2011. Facts provided at Portsmouth Naval Shipyard Website. http://www.navsea.navy.mil/shipyards/portsmouth/pages/Facts. Accessed February 13, 2011.

Rand and Petrocelli, 1985. Fundamentals of Aquatic Toxicology; Methods and Applications. Edited by G.M Rand and S.R. Petrocelli, Hemisphere Publishing Corporation.

Shaw (Shaw Environmental, Inc.), July 2008. Contractor Closeout Report and As-built Drawings for Site 34 Shoreline Stabilization and Removal Action, Portsmouth Naval Shipyard, Kittery, Maine. Shaw, Norfolk, Virginia.

Soil Conservation Service, August 1985. Soil and Water Conservation Land Management Plan. United States Department of Agriculture, in cooperation with York County Soil and Water Conservation District, Sanford, Maine.

Strafford, May 2005. Strafford Regional Planning Area New Hampshire Regional Master Plan: Toward the Year 2020. Strafford Regional Planning Commission, Dover, New Hampsire. Available at www.strafford.org.

Tetra Tech (Tetra Tech NUS, Inc.), August 1999, Groundwater Monitoring Summary Report (December 1996 – November 1997), Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

Tetra Tech, October 1999. Interim Offshore Monitoring Plan Operable Unit 4 for Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

Tetra Tech, March 2003. Site 34 Site Investigation Quality Assurance Project Plan for Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

Tetra Tech, August 2004. Site Screening Investigation Report for Site 34, Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania. (Includes Site 34 Site Investigation Data Package for Portsmouth Naval Shipyard, Kittery, Maine, Tetra Tech NUS, Inc., King of Prussia, Pennsylvania, December 2003, as Appendix A.)

Tetra Tech, September 2005. Engineering Evaluation/Cost Analysis for Site 34, Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

Tetra Tech, July 2009. Sampling and Analysis Plan for Operable Unit 9 Remedial Investigation, Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

Tetra Tech, January 2010. Remedial Investigation Data Package for Operable Unit 9, Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

Tetra Tech, January 2011. Remedial Investigation Supplemental Data Package for Operable Unit 9, Portsmouth Naval Shipyard, Kittery, Maine. Tetra Tech NUS, Inc., King of Prussia, Pennsylvania.

United States Department of Agriculture (USDA), 2009. Web Soil Survey. Available online at http://websoilsurvey.nrcs.usda.gov/. Accessed 10/29/2009.

USEPA (United States Environmental Protection Agency), October 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA - Interim Final. EPA/540/G-89/004.Office of Emergency and Remedial Response, Washington, D.C.

USEPA, March 1989, HSWA Permit for Portsmouth Naval Shipyard, Permit Under the Hazardous and Solid Waste Amendments of 1984. USEPA, March 10.

USEPA, December 1989. Risk Assessment Guidance for Superfund (RAGS) - Volume I - Human Health Evaluation Manual (Part A) - Interim Final. EPA/540/1-89/002. Office of Emergency and Remedial Response.

USEPA, March 1991. Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors. Office of Solid Waste and Emergency Response (OSWER), Washington, D.C. Directive 9285.6 03.

USEPA, February 1992. Guidance on Risk Characterization for Risk Managers and Risk Assessors. Office of the Administrator, Washington, DC.

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

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

USEPA, July 1994. Revised Interim Guidance on Establishing Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. OSWER Directive 9355.4-12.

USEPA, August 1997. Exposure Factors Handbook. EPA/600/8-89/043. Office of Health and Environmental Assessment, Exposure Assessment Group. Washington, D.C.

USEPA, April 1999. Use of the Technical Review Workgroup (TRW) Interim Adult Lead Methodology in Risk Assessment. Memorandum from Pat Van Leewven and Paul White to Mark Maddaloni.

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

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

USEPA, May 2002. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows 32-bit version. [EPA 9285.7-42].

USEPA, January 2003. Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. USEPA. Washington, DC. EPA-540-R-03-001. [URL: http://www.epa.gov/superfund/programs/lead/adult.htm].

USEPA, November 2003. Assessing Intermittent or Variable Exposures at Lead Sites. OSWER, Washington, D.C. EPA-540-R03-008, OSWER #9285.7-76.

USEPA, July 2004. 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. EPA/540/R/99/005.

USEPA, March 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum, Washington, DC.

USEPA, March 2005b. Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum, Washington, DC. March.

USEPA, 2009. Soil Screening Guidance, USEPA website: http://rais.ornl.gov/epa/ssl1.shtml - Accessed August 2009.

USEPA, January 2009. 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. 20460 EPA-540-R-070-002, OSWER 9285.7-82.

USEPA, June 2009. Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Baseline Geometric Standard Deviation Parameters. Office of Superfund Remediation and Technology Innovation, Washington, D.C. 20460 EPA-540-R-070-002, OSWER 9200.2-82.

USEPA, February 2010. Integrated Exposure Uptake Biokinetic Model for Lead in Children, Windows® version (IEUBKwin v 1.1 Build 11).

USEPA, May 2010a. ProUCL Version 4.1.00 Draft User Guide. Office of Research and Development, Washington, D.C. EPA/600/R-07/038.

USEPA, May 2010b. USEPA TRW for Lead. Guidance Document. Frequently Asked Question (FAQs) on the Adult Lead Model. May 10. http://www.epa.gov/superfund/lead/almfaq.htm.

USEPA, November 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites, http://epa-prgs.ornl.gov/chemicals/index.shtml.

USEPA, December 2010. Integrated Risk Information System, On-Line Data Base. Environmental Criteria and Assessment Office, Cincinnati, OH. http://www.epa.gov/iris/index.html.

Weston, June 1983. Initial Assessment Study of Portsmouth Naval Shipyard. Naval Energy and Environmental Support Activity, NEESA 13-032, Port Hueneme.

APPENDIX A

SUPPORTING INFORMATION

A.1 SUMMARY OF OU9 BORING DATA AND PERCENT ASH CALCULATIONS

A.2 SOIL BORING LOGS

A.3 CONCENTRATION CROSS-SECTION FIGURE

A.4 PRE AND POST EXCAVATION AS-BUILT FIGURES

A.1 SUMMARY OF OU9 BORING DATA AND PERCENT ASH CALCULATIONS

Methodology for Calculating Percent Ash/Burnt Material Estimate

The percentage of ash/burnt material remaining in overburden at OU9 was estimated using the following information: depth to top of ash/burnt material from ground surface, depth to bottom of ash/burnt material from ground surface, thickness of ash/burnt material, refusal depth of boring, excavated thickness, and backfill thickness at each individual boring location.

"Depth to top of ash/burnt material", "depth to bottom of ash/burnt material", "thickness of ash/burnt material", and "refusal depth of boring" were determined from soil boring log sheets. "Excavated thickness" was determined using Section 3 cross-sections or by using a light table to place all of the OU9 borings onto Figure 2 in Appendix A-4 and then subtracting the excavation elevation from the original ground elevation per boring. "Fill thickness" was determined by subtracting the excavation surface elevation (see Figure 2 in Appendix A-4) from the current ground surface elevation at each boring location (see Figure 3-1).

Once all the information was known, the "post-excavation ash/ burnt material thickness" was calculated for each boring location. If the excavation failed to remove all ash/burnt material then the remaining ash/burnt material thickness was recorded in the column "post-excavation ash/burnt material" (See Table A.2 of Appendix A-1). The minimum and maximum estimated ash/burnt material thicknesses were reported for some borings due to uncertainty related to incomplete recovery in the soil boring. Next, the "total depth of overburden" at each boring location was calculated by subtracting the "excavated thickness" from the "refusal depth" (assumed to be total overburden thickness) and then adding the "fill thickness". The "total depth of overburden" was limited to a maximum of ten feet for the ash percentage calculation because exposure risk is only considered for the top ten feet of soil. Finally, the minimum and maximum ash/burnt material percentages were calculated by dividing the "total depth of overburden" by the "minimum and maximum estimated ash/burnt material thickness" and multiplying by 100. Once, the minimum and maximum ash/burnt material percentages were calculated for each individual boring those values were averaged and resulted in an estimated OU9 overburden ash/burnt material percentage range of 4.3 to 4.9 percent.

To be conservative it was assumed the approximately 5 percent of the overburden at OU9 contains ash or burnt material. This estimation assumes that the borings evaluated are representative entire OU9 overburden landmass.

Table A.1
SUMMARY OF OU9 BORING DATA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness (ft)	Fill Thickness (ft)	Post Excavation Ash/ Burnt Material Thickness (ft)	Total Thickness of Overburden (ft)	Comment
2003 SOIL BORINGS											
34-01	No	Asphalt			0.00	12.0	1.1	1.1	0.00	12.00	Depths corrected to true Ground Surface
34-02	Yes	Dirt/Gravel	1.5	1.7	0.20	10.0	1.2	1.2	0.20	10.00	Depths corrected to true Ground Surface
34-03	No	Asphalt			0.00	12.0	0.0	0.0	0.00	12.00	Depths corrected to true Ground Surface
34-03A	Yes	Asphalt	1.0	1.1	0.10	1.0	1.1	1.2	0.00	1.10	Depths corrected to true Ground Surface
34-04	Yes	Asphalt	0.5	3.0	2.50	7.5	3.6	4.5	0.00	8.40	Depths corrected to true Ground Surface
34-04A	Yes	Asphalt	1.5	1.6	0.10	5.0	3.1	4.3	0.00	6.15	Depths corrected to true Ground Surface
34-04B	No	Asphalt			0.00	5.0	2.0	2.0	0.00	5.00	Depths corrected to true Ground Surface
34-04C	Yes	Asphalt	1.5	2.0	0.50	5.0	3.5	4.0	0.00	5.50	Depths corrected to true Ground Surface
34-05	Yes	Grass	1.2	5.2	4.00	12.0	6.7	5.8	0.00	11.10	Depths corrected to true Ground Surface
34-06	Yes	Grass	1.2, 2.9	1.4, 3.2	0.50	5.0	3.7	4.4	0.00	5.70	Depths corrected to true Ground Surface
34-07	Yes	Grass	2.2, 3	2.3, 5	2.10	7.0	2.4	1.3	2.00	5.90	Depths corrected to true Ground Surface
34-08	Yes	Grass	0.6, 2.6	2.1, 3.1	2.00	5.0	**2.3**	1.3	0.50	4.00	Depths corrected to true Ground Surface
34-09	Yes	Grass	0.7	1.2	0.50	3.0	2.2	1.2	0.00	2.00	Depths corrected to true Ground Surface
34-10	No	Grass			0.00	3.0	2.4	1.9	0.00	2.50	Depths corrected to true Ground Surface
34-11	No	Asphalt			0.00	3.0	1.6	1.6	0.00	3.00	Depths corrected to true Ground Surface
34-11A	Yes	Asphalt	1.5, 2.4	2, 2.6	0.70	5.0	1.7	2.3	0.60	5.60	Depths corrected to true Ground Surface
34-12	Yes	Grass	0.2. 1.2, 2.9	0.7, 2.7, 4.2	3.30	10.0	5.0	4.7	0.00	9.70	Depths corrected to true Ground Surface
34-13	Yes	Grass	1.0	2.0	1.00	6.0	2.2	0.8	0.00	4.60	Depths corrected to true Ground Surface
34-14	Yes	Asphalt	2.5	5.5	3.00	10.0	2.8	2.5	2.70	9.70	Depths corrected to true Ground Surface
34-14A	Yes	Asphalt	4.0	5.5	1.50	10.0	2.8	2.5	1.50	9.70	Depths corrected to true Ground Surface
34-14B	Yes	Asphalt	2.5	3.5	1.00	3.5	3.5	3.1	0.00	3.10	Depths corrected to true Ground Surface
34-15	Yes	Asphalt	2.0, 4.5	3.5, 5.5	2.50	8.0	0.6	0.6	2.50	8.00	Depths corrected to true Ground Surface
34-15A	Yes	Asphalt	1.5	1.9	0.40	5.0	2.1	2.1	0.00	5.00	Depths corrected to true Ground Surface
34-16	Yes	Asphalt	2.0	4.0	2.00	10.0	2.2	2.2	1.80	10.00	Depths corrected to true Ground Surface
34-17	Yes	Grass	2.2	3.2	1.00	11.0	2.5	1.3	0.00	9.80	Depths corrected to true Ground Surface
34-17A	No	Grass			0.00	1.5	1.9	0.3	0.00	-0.15	Depths corrected to true Ground Surface
2004 SOIL BORINGS											
34-100	No	Asphalt			0.00	5.0	1.5	1.5	0.00	5.00	
34-101	Yes	Dirt/Gravel	0.3	0.8	0.50	3.0	1.2	0.2	0.00	2.00	
34-102	Yes	Dirt/Gravel	1.0	1.5	0.50	5.0	1.7	1.5	0.00	4.80	
34-103	Yes	Asphalt	0.2, 4.1	0.7, 4.3	0.5 - 0.7*	5.0	1.4	0.8	0.2*	4.40	*Ash at 4.1 to 4.3 may be slough
34-104	Yes	Asphalt	0.8	0.9	0.10	6.5	1.0	0.6	0.00	6.10	
34-105	No	Asphalt			0.00	7.0	1.4	1.4	0.00	7.00	
34-106	Yes	Asphalt	1.0	1.5	0.50	3.0	2.9	2.0	0.00	2.10	
34-107	No	Asphalt			0.00	7.0	1.6	1.4	0.00	6.80	
34-108	No	Asphalt			0.00	7.0	1.9	1.5	0.00	6.60	
34-109	No	Asphalt			0.00	11.0	2.8	2.8	0.00	11.00	
34-110	No	Asphalt			0.00	10.0	2.4	2.4	0.00	10.00	
34-111	No	Asphalt			0.00	12.0	2.6	1.6	0.00	11.00	
34-112	Yes	Asphalt	2.0	2.5	0.5* - 2.0	12.0	3.2	2.7	0.00	11.50	No recovery from 2.5 to 4.0 feet in DPT run #1
34-113	Yes	Asphalt	1.3	2.3	1.0* - 2.7	12.0	3.1	2.6	0.00	11.50	No recovery from 2.3 to 4.0 feet in DPT run #1
34-114	Yes	Asphalt	1.6	2.0	0.40	10.0	2.8	2.5	0.00	9.70	

Notes:
1.) Asterisk by value in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" after value in Thickness of Ash Column represents that ash may be thicker than measured.

Table A.1
SUMMARY OF OU9 BORING DATA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness (ft)	Fill Thickness (ft)	Post Excavation Ash/ Burnt Material Thickness (ft)	Total Thickness of Overburden (ft)	Comment
34-115	Yes	Asphalt	0.7	1.7	1.00	12.0	0.5	0.5	1.00	12.00	
34-116	Yes	Asphalt	2.5	2.7	0.20	12.0	0.0	0.0	0.20	12.00	
34-117	Yes	Asphalt	1.3	2.1	0.80	6.0	0.0	0.0	0.80	6.00	
34-118	Yes	Asphalt	1.0	1.1	0.10	4.0	0.0	0.0	0.10	4.00	
34-120	Yes	Dirt/Gravel	0.8, 4.0	1.1, 4.8	1.10	8.0	0.0	0.0	1.10	8.00	Lower layer of Ash appears genuine
34-121	Yes	Grass	0.6	2.0	0.1 - 1.4*	7.5	0.0	0.0	1.40	7.50	Definite Ash layer at 1.9 to 2.0, other area mixed with soil
34-123	No	Asphalt			0.00	6.5	3.0	3.0	0.00	6.50	
34-124	Yes	Grass	0.7	0.95	0.25	7.0	1.8	1.7	0.00	6.90	
34-124-125MID	No	Asphalt			0.00	4.5	1.7	2.0	0.00	4.80	
34-125	No	Grass			0.00	5.0	1.8	1.8	0.00	5.00	
34-126	Yes	Asphalt	0.6, 4.0	1.4, 4.5	0.8* - 1.3	4.5	2.1	2.7	0.00	5.10	Ash at 4.0 to 4.5 may be slough
34-127	Yes	Asphalt	1.2, 1.7	1.5, 1.9	0.50	5.5	2.6	2.5	0.00	5.40	
34-127-129MID	Yes	Grass	0.5, 1.6	0.6, 2.1	0.6* - 2.5	7.0	0.0	0.0	0.6-2.5*	7.00	No recovery from 2.1 to 4.0 feet in DPT run #1
34-128	Yes	Asphalt	0.5, 1.8	0.9, 2.2	0.80	6.5	3.0	3.6	0.00	7.10	
34-129	Yes	Asphalt	2.1, 4.0	2.3, 4.3	0.2 - 0.5*	7.0	0.0	0.0	0.2 - 0.5*	7.00	Ash at 4.0 to 4.3 may be slough
34-130	Yes	Grass	0.75, 1.5	0.9, 1.8	0.45* - 2.7	10.0	0.0	0.0	0.45* - 2.7	10.00	No recovery from 1.8 to 4.0 feet in DPT run#1
34-131	Yes	Grass	1.3	1.4	0.1+	1.4	0.0	0.0	0.1+	1.40	Ash may be thicker than 0.1 feet
34-132	Yes	Grass	2.0	3.0	1.00	3.8	0.0	0.0	1.00	3.80	
34-133	Yes	Grass	2.5	2.8	0.3+	2.8	0.0	0.0	0.3+	2.80	Ash may be thicker than 0.3 feet
34-134	Yes	Grass	0.1, 4.0, 5.5	1.5, 4.7, 5.7	4.80	11.0	6.1	5.8	0.00	10.70	Assumed Ash from 1.5 to 4.0 where no recovery in DPT run #1
34-135	Yes	Grass	1.3, 4.0	1.5, 4.4	0.6 - 3.1*	13.5	0.0	0.0	0.6 - 3.1*	13.50	Assumed Ash from 1.5 to 4.0 where no recovery in DPT run #1
34-136	No	Grass			0.00	10.0	0.0	0.0	0.00	10.00	
34-137	Yes	Grass	0.2, 1.7, 4.0	1.4, 1.9, 4.6	4.10	12.0	6.0	3.9	0.00	9.90	Assumed Ash from 1.9 to 4.0 where no recovery in DPT run #1
34-138	Yes	Grass	0.9	1.3	0.40	4.0	1.6	2.0	0.00	4.40	
34-139	No	Asphalt			0.00	4.0	0.0	0.0	0.00	4.00	
34-200	Yes	Asphalt	0.9	1.4	0.50	5.0	1.9	1.6	0.00	4.65	
34-201	Yes	Asphalt	1.1	1.4	0.30	3.0	1.8	1.5	0.00	2.70	
34-202	No	Asphalt			0.00	3.0	1.5	1.1	0.00	2.60	
34-203	Yes	Asphalt	0.4	0.8	0.40	4.0	1.0	1.0	0.00	4.00	
34-204	Yes	Asphalt	4.3	4.5	0.20	5.5	1.4	1.4	0.20	5.50	
34-205	Yes	Asphalt	0.1	0.4	0.30	4.0	1.0	1.0	0.00	4.00	
34-206	No	Asphalt			0.00	3.0	1.3	1.3	0.00	3.00	
34-207	Yes	Asphalt	1.2	1.3	0.10	6.0	1.3	0.9	0.00	5.60	
34-208	No	Asphalt			0.00	7.0	1.7	1.7	0.00	7.00	
34-210	No	Asphalt			0.00	8.5	1.8	1.8	0.00	8.50	
34-211	Yes	Asphalt	1.1	1.3	0.20	4.5	2.4	2.4	0.00	4.50	
34-212A	Yes	Asphalt	1.3	1.6	0.30	2.0	2.4	2.1	0.00	1.70	
34-212B	Yes	Asphalt	1.0	1.4	0.40	12.0	2.2	2.0	0.00	11.80	
34-213	Yes	Asphalt	1.4	2.1	0.70	12.0	2.5	2.2	0.00	11.70	
34-214	No	Asphalt			0.00	3.5	2.2	1.4	0.00	2.70	
34-215	Yes	Asphalt	0.7	0.9	0.20	6.0	2.9	2.6	0.00	5.70	
34-216	No	Asphalt			0.00	10.0	0.0	0.0	0.00	10.00	
34-219A	Yes	Grass	1.0, 1.5, 1.8	1.1, 1.6, 2.2	0.60	5.0	0.0	0.0	0.70	5.00	Second run used, First run suspicious of fill material

Notes:
1.) Asterisk by value in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" after value in Thickness of Ash Column represents that ash may be thicker than measured.

Table A.1
SUMMARY OF OU9 BORING DATA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness (ft)	Fill Thickness (ft)	Post Excavation Ash/ Burnt Material Thickness (ft)	Total Thickness of Overburden (ft)	Comment
34-219B	Yes	Grass	0.8	1.0	0.20	7.5	0.0	0.0	0.20	7.50	Near Silt Fence
34-220	Yes	Grass	0.9	1.2	0.30	4.0	0.0	0.0	0.30	4.00	
34-221-222MID	No	Grass			0.00	10.5	0.0	0.0	0.00	10.50	
34-221A	No	Grass			0.00	4.0	0.0	0.0	0.00	4.00	
34-221B	No	Grass			0.00	2.5	0.0	0.0	0.00	2.50	
34-222	No	Grass			0.00	6.0	0.0	0.0	0.00	6.00	
34-223	Yes	Grass	0.3, 4.0	1.8, 5.1	4.80	12.0	6.0	2.8	0.00	8.75	Assumed Ash from 1.8 to 4.0 where no recovery in DPT run #1
34-224	Yes	Grass	0.4	0.7	0.30	3.5	0.0	0.0	0.30	3.50	
34-225	No	Asphalt			0.00	5.5	0.0	0.0	0.00	5.50	
34-226	No	Asphalt			0.00	7.0	2.2	1.8	0.00	6.60	
34-227	No	Asphalt			0.00	6.0	2.7	2.5	0.00	5.80	
34-228	No	Asphalt			0.00	6.0	2.1	1.7	0.00	5.60	
34-250	Yes	Asphalt	1.3	1.6	0.30	4.0	1.7	2.4	0.00	4.70	
34-251	No	Asphalt			0.00	6.0	1.4	1.4	0.00	6.00	
34-252	Yes	Asphalt	0.7, 1.5, 1.8, 2.2	1.0, 1.6, 2.0, 2.8	1.20	4.0	1.4	1.3	0.90	3.90	
34-253	No	Asphalt			0.00	5.0	1.4	1.4	0.00	5.00	
34-254	Yes	Asphalt	1.0	1.4	0.40	4.0	2.4	2.4	0.00	4.00	
34-255	Yes	Asphalt	1.1	1.5	0.40	3.0	1.0	1.0	0.40	3.00	
34-256	Yes	Asphalt	0.9, 1.4	1.2, 1.8	0.70	9.0	2.2	2.1	0.00	8.90	
34-257	Yes	Asphalt	0.9	1.3	0.40	4.0	2.0	2.0	0.00	4.00	
34-HA-1	Yes	Grass	1.0	1.4	0.40	1.4	0.0	0.0	0.50	1.40	
34-HA-2	Yes	Grass	0.9	1.3	0.40	2.2	0.0	0.0	0.40	2.20	
34-HA-3	Yes	Grass	0.3	1.0	0.70	1.0	0.0	0.0	0.40	1.00	
34-HA-4	No	Grass			0.00	1.4	0.0	0.0	0.00	1.40	
34-HA-5	Yes	Grass	0.4	0.8	0.40	1.4	0.0	0.0	0.40	1.40	
34-HA-6	Yes	Grass	0.4	1.4	1.00	1.4	0.0	0.0	1.00	1.40	
34-HA-7	No	Grass			0.00	1.4	0.0	0.0	0.00	1.40	
34-HA-8	Yes	Grass	0.8	1.0	0.20	1.4	0.0	0.0	0.40	1.40	
2009 SOIL BORINGS											
OU9-01	No	Topsoil			0.00	4.5	NA	NA	0.00	4.5	some coal chips 2-3" at 14"
OU9-02	No	Topsoil			0.00	2.0	NA	NA	0.00	2.0	
OU9-03	No	Topsoil			0.00	2.0	NA	NA	0.00	2.0	
OU9-04	Yes	Topsoil	1.25, 5.0, 7.0	1.5, 5.05, 7.25	0.55	8.0	NA	NA	0.55	8.0	
OU0-05	No	Fill material from drain			0.00	8.0	NA	NA	0.00	8.0	Near stormwater drain
OU0-05B	No	Topsoil			0.00	7.0	NA	NA	0.00	7.0	
OU9-06	No	Topsoil			0.00	8.0	NA	NA	0.00	8.0	
OU9-07	No	Concrete			0.00	17.0	NA	NA	0.00	17.0	
OU9-08	No	Concrete			0.00	9.0	NA	NA	0.00	9.0	
OU9-09	No	Concrete			0.00	4.5	NA	NA	0.00	4.5	
OU9-10	No	Topsoil			0.00	8.0	NA	NA	0.00	8.0	
OU9-11	No	Topsoil			0.00	8.0	NA	NA	0.00	8.0	
OU9-12	No	Topsoil			0.00	8.0	NA	NA	0.00	8.0	

Notes:
1.) Asterisk by value in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" after value in Thickness of Ash Column represents that ash may be thicker than measured.

Table A.1
SUMMARY OF OU9 BORING DATA
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness (ft)	Fill Thickness (ft)	Post Excavation Ash/ Burnt Material Thickness (ft)	Total Thickness of Overburden (ft)	Comment
OU9-13	Yes	Topsoil	6.7	7.4	0.70	8.0	NA	NA	0.70	8.0	
OU9-14	Yes	Topsoil	6,8	6.2,8.25	0.45	10.0	NA	NA	0.00	10.0	coal pieces 6'-8.25'
OU9-15	Yes	Topsoil			0.00	10.5	NA	NA	0.00	10.5	some coal pieces
2010 SOIL BORINGS											
OU9-16	No	Asphalt			0.00	8.0	NA	NA	0.00	8.0	
OU9-17	No	Asphalt			0.00	8.0	NA	NA	0.00	8.0	
OU9-18	No	Asphalt			0.00	8.0	NA	NA	0.00	8.0	
OU9-19	No	Loam			0.00	8.0	NA	NA	0.00	8.0	glass and terra cotta frags 1'-2'
OU9-20	No	Loam			0.00	8.0	NA	NA	0.00	8.0	terra cotta frags
OU9-21	No	Loam			0.00	8.0	NA	NA	0.00	8.0	
OU9-22	Yes	Topsoil	6.5	7.0	0.50	8.0	NA	NA	0.50	8.0	slag, charred terra cotta, glass frags, tar like substance (7')
OU9-23	No	Topsoil			0.00	4.0	NA	NA	0.00	4.0	
OU9-24	No	Loam			0.00	4.5	NA	NA	0.00	4.5	slag
OU9-25	No	Asphalt			0.00	8.0	NA	NA	0.00	8.0	

Notes:
1.) Asterisk by value in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" after value in Thickness of Ash Column represents that ash may be thicker than measured.

TABLE A-2
PERCENT ASH CALCULATIONS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Pre-Excavation Ground Elevation (ft PNS Vert.)	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness	Fill Thickness	Post-Excavation Ash/ Burnt Material Thickness	Total Depth of Overburden**	Minimum Estimated Ash/Burnt Material Thickness	Maximum Estimated Ash/Burnt Material Thickness	Minimum Ash/Burnt Material Percentage	Maximum Ash/Burnt Material Percentage	Comment
34-100	No	Asphalt	114.49			0.00	5.0	1.5	1.5	0.00	5.00	0.00	0.00	0.00	0.00	
34-101	Yes	Dirt/Gravel	115.99	0.3	0.8	0.50	3.0	1.2	0.2	0.00	2.00	0.00	0.00	0.00	0.00	
34-102	Yes	Dirt/Gravel	118.06	1.0	1.5	0.50	5.0	1.7	1.5	0.00	4.80	0.00	0.00	0.00	0.00	
34-103	Yes	Asphalt	117.57	0.2, 4.1	0.7, 4.3	0.5 - 0.7*	5.0	1.4	0.8	0.3*	4.40	0.00	0.30	0.00	6.82	*Ash at 4.1 to 4.3 may be slough
34-104	Yes	Asphalt	118.99	0.8	0.9	0.10	6.5	1.0	0.6	0.00	6.10	0.00	0.00	0.00	0.00	
34-105	No	Asphalt	119.40			0.00	7.0	1.4	1.4	0.00	7.00	0.00	0.00	0.00	0.00	
34-106	Yes	Asphalt	120.54	1.0	1.5	0.50	3.0	2.9	2.0	0.00	2.10	0.00	0.00	0.00	0.00	
34-107	No	Asphalt	119.08			0.00	7.0	1.6	1.4	0.00	6.80	0.00	0.00	0.00	0.00	
34-108	No	Asphalt	119.26			0.00	7.0	1.9	1.5	0.00	6.60	0.00	0.00	0.00	0.00	
34-109	No	Asphalt	120.02			0.00	11.0	2.8	2.8	0.00	10.00	0.00	0.00	0.00	0.00	
34-110	No	Asphalt	119.84			0.00	10.0	2.4	2.4	0.00	10.00	0.00	0.00	0.00	0.00	
34-111	No	Asphalt	119.80			0.00	12.0	2.6	1.6	0.00	10.00	0.00	0.00	0.00	0.00	
34-112	Yes	Asphalt	119.44	2.0	2.5	0.5* - 2.0	12.0	3.2	2.7	0.00	10.00	0.00	0.00	0.00	0.00	No recovery from 2.5 to 4.0 feet in DPT run #1
34-113	Yes	Asphalt	119.33	1.3	2.3	1.0* - 2.7	12.0	3.1	2.6	0.00	10.00	0.00	0.00	0.00	0.00	No recovery from 2.3 to 4.0 feet in DPT run #1
34-114	Yes	Asphalt	119.38	1.6	2.0	0.40	10.0	2.8	2.5	0.00	9.70	0.00	0.00	0.00	0.00	
34-115	Yes	Asphalt	119.40	0.7	1.7	1.00	12.0	0.5	0.5	1.00	10.00	1.00	1.00	10.00	10.00	
34-116	Yes	Asphalt	119.50	2.5	2.7	0.20	12.0	0.0	0.0	0.20	10.00	0.20	0.20	2.00	2.00	
34-117	Yes	Asphalt	119.60	1.3	2.1	0.80	6.0	0.0	0.0	0.80	6.00	0.80	0.80	13.33	13.33	
34-118	Yes	Asphalt	119.85	1.0	1.1	0.10	4.0	0.0	0.0	0.10	4.00	0.10	0.10	2.50	2.50	
34-120	Yes	Dirt/Gravel	117.25	0.8, 4.0	1.1, 4.8	1.10	8.0	0.0	0.0	1.10	8.00	1.10	1.10	13.75	13.75	Lower layer of Ash appears genuine
34-121	Yes	Grass	117.75	0.6	2.0	0.1 - 1.4*	7.5	0.0	0.0	1.40	7.50	1.40	1.40	18.67	18.67	Definite Ash layer at 1.9 to 2.0, other area mixed with soil
34-123	No	Asphalt	118.01			0.00	6.5	3.0	3.0	0.00	6.50	0.00	0.00	0.00	0.00	
34-124	Yes	Grass	116.84	0.7	0.95	0.25	7.0	1.8	1.7	0.00	6.90	0.00	0.00	0.00	0.00	
34-124-125MID	No	Asphalt	116.49			0.00	4.5	1.7	2.0	0.00	4.80	0.00	0.00	0.00	0.00	
34-125	No	Grass	116.34			0.00	5.0	1.8	1.8	0.00	5.00	0.00	0.00	0.00	0.00	
34-126	Yes	Asphalt	116.63	0.6, 4.0	1.4, 4.5	0.8* - 1.3	4.5	2.1	2.7	0.00	5.10	0.00	0.00	0.00	0.00	Ash at 4.0 to 4.5 may be slough
34-127	Yes	Asphalt	115.56	1.2, 1.7	1.5, 1.9	0.50	5.5	2.6	2.5	0.00	5.40	0.00	0.00	0.00	0.00	
34-127-129MID	Yes	Grass	115.30	0.5, 1.6	0.6, 2.1	0.6* - 2.5	7.0	0.0	0.0	0.6-2.5*	7.00	0.60	2.50	8.57	35.71	No recovery from 2.1 to 4.0 feet in DPT run #1
34-128	Yes	Asphalt	116.01	0.5, 1.8	0.9, 2.2	0.80	6.5	3.0	3.6	0.00	7.10	0.00	0.00	0.00	0.00	
34-129	Yes	Asphalt	114.99	2.1, 4.0	2.3, 4.3	0.2 - 0.5*	7.0	0.0	0.0	0.2 - 0.5*	7.00	0.20	0.50	2.86	7.14	Ash at 4.0 to 4.3 may be slough
34-130	Yes	Grass	114.47	0.75, 1.5	0.9, 1.8	0.45* - 2.7	10.0	0.0	0.0	0.45* - 2.7	10.00	0.45	2.70	4.50	27.00	No recovery from 1.8 to 4.0 feet in DPT run#1
34-131	Yes	Grass	113.83	1.3	1.4	0.1+	1.4	0.0	0.0	0.1+	1.40	0.10	0.10	7.14	7.14	Ash may be thicker than 0.1 feet
34-132	Yes	Grass	113.54	2.0	3.0	1.00	3.8	0.0	0.0	1.00	3.80	1.00	1.00	26.32	26.32	
34-133	Yes	Grass	112.38	2.5	2.8	0.3+	2.8	0.0	0.0	0.3+	2.80	0.30	0.30	10.71	10.71	Ash may be thicker than 0.3 feet
34-134	Yes	Grass	118.12	0.1, 4.0, 5.5	1.5, 4.7, 5.7	4.80	11.0	6.1	5.8	0.00	10.00	0.00	0.00	0.00	0.00	Assumed Ash from 1.5 to 4.0 where no recovery in DPT run #1
34-135	Yes	Grass	111.81	1.3, 4.0	1.5, 4.4	0.6 - 3.1*	13.5	0.0	0.0	0.6 - 3.1*	10.00	0.60	3.10	6.00	31.00	Assumed Ash from 1.5 to 4.0 where no recovery in DPT run #1
34-136	No	Grass	111.51			0.00	10.0	0.0	0.0	0.00	10.00	0.00	0.00	0.00	0.00	
34-137	Yes	Grass	117.79	0.2, 1.7, 4.0	1.4, 1.9, 4.6	4.10	12.0	6.0	3.9	0.00	9.90	0.00	0.00	0.00	0.00	Assumed Ash from 1.9 to 4.0 where no recovery in DPT run #1
34-138	Yes	Grass	110.10	0.9	1.3	0.40	4.0	1.6	2.0	0.00	4.40	0.00	0.00	0.00	0.00	
34-139	No	Asphalt	110.97			0.00	4.0	0.0	0.0	0.00	4.00	0.00	0.00	0.00	0.00	
34-200	Yes	Asphalt	114.35	0.9	1.4	0.50	5.0	1.9	1.6	0.00	4.65	0.00	0.00	0.00	0.00	
34-201	Yes	Asphalt	115.78	1.1	1.4	0.30	3.0	1.8	1.5	0.00	2.70	0.00	0.00	0.00	0.00	
34-202	No	Asphalt	116.93			0.00	3.0	1.5	1.1	0.00	2.60	0.00	0.00	0.00	0.00	
34-203	Yes	Asphalt	117.25	0.4	0.8	0.40	4.0	1.0	1.0	0.00	4.00	0.00	0.00	0.00	0.00	
34-204	Yes	Asphalt	118.45	4.3	4.5	0.20	5.5	1.4	1.4	0.20	5.50	0.20	0.20	3.64	3.64	
34-205	Yes	Asphalt	118.79	0.1	0.4	0.30	4.0	1.0	1.0	0.00	4.00	0.00	0.00	0.00	0.00	
34-206	No	Asphalt	119.15			0.00	3.0	1.3	1.3	0.00	3.00	0.00	0.00	0.00	0.00	
34-207	Yes	Asphalt	119.07	1.2	1.3	0.10	6.0	1.3	0.9	0.00	5.60	0.00	0.00	0.00	0.00	
34-208	No	Asphalt	118.95			0.00	7.0	1.7	1.7	0.00	7.00	0.00	0.00	0.00	0.00	
34-210	No	Asphalt	118.78			0.00	8.5	1.8	1.8	0.00	8.50	0.00	0.00	0.00	0.00	
34-211	Yes	Asphalt	118.97	1.1	1.3	0.20	4.5	2.4	2.4	0.00	4.50	0.00	0.00	0.00	0.00	
34-212A	Yes	Asphalt	119.17	1.3	1.6	0.30	2.0	2.4	2.1	0.00	1.70	0.00	0.00	0.00	0.00	
34-212B	Yes	Asphalt	119.00	1.0	1.4	0.40	12.0	2.2	2.0	0.00	10.00	0.00	0.00	0.00	0.00	
34-213	Yes	Asphalt	119.14	1.4	2.1	0.70	12.0	2.5	2.2	0.00	10.00	0.00	0.00	0.00	0.00	
34-214	No	Asphalt	119.19			0.00	3.5	2.2	1.4	0.00	2.70	0.00	0.00	0.00	0.00	
34-215	Yes	Asphalt	119.34	0.7	0.9	0.20	6.0	2.9	2.6	0.00	5.70	0.00	0.00	0.00	0.00	
34-216	No	Asphalt	119.58			0.00	10.0	0.0	0.0	0.00	10.00	0.00	0.00	0.00	0.00	
34-219A	Yes	Grass	117.02	1.0, 1.5, 1.8	1.1, 1.6, 2.2	0.60	5.0	0.0	0.0	0.70	5.00	0.70	0.70	14.00	14.00	Second run used, First run suspicious of fill material
34-219B	Yes	Grass	117.00	0.8	1.0	0.20	7.5	0.0	0.0	0.20	7.50	0.20	0.20	2.67	2.67	Near Silt Fence
34-220	Yes	Grass	116.45	0.9	1.2	0.30	4.0	0.0	0.0	0.30	4.00	0.30	0.30	7.50	7.50	

Notes:
1.) "*" in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" in Thickness of Ash Column represents that ash may be thicker than measured.
3.) "**" indicates max. overburden to 10 feet, see Methodology.

TABLE A-2
PERCENT ASH CALCULATIONS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Pre-Excavation Ground Elevation (ft PNS Vert.)	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness	Fill Thickness	Post-Excavation Ash/ Burnt Material Thickness	Total Depth of Overburden**	Minimum Estimated Ash/Burnt Material Thickness	Maximum Estimated Ash/Burnt Material Thickness	Minimum Ash/Burnt Material Percentage	Maximum Ash/Burnt Material Percentage	Comment
34-221-222MID	No	Grass	115.52			0.00	10.5	0.0	0.0	0.00	10.00	0.00	0.00	0.00	0.00	
34-221A	No	Grass	116.04			0.00	4.0	0.0	0.0	0.00	4.00	0.00	0.00	0.00	0.00	
34-221B	No	Grass	115.95			0.00	2.5	0.0	0.0	0.00	2.50	0.00	0.00	0.00	0.00	
34-222	No	Grass	115.20			0.00	6.0	0.0	0.0	0.00	6.00	0.00	0.00	0.00	0.00	
34-223	Yes	Grass	117.51	0.3, 4.0	1.8, 5.1	4.80	12.0	6.0	2.8	0.00	8.75	0.00	0.00	0.00	0.00	Assumed Ash from 1.8 to 4.0 where no recovery in DPT run #1
34-224	Yes	Grass	109.86	0.4	0.7	0.30	3.5	0.0	0.0	0.30	3.50	0.30	0.30	8.57	8.57	
34-225	No	Asphalt	110.40			0.00	5.5	0.0	0.0	0.00	5.50	0.00	0.00	0.00	0.00	
34-226	No	Asphalt	112.46			0.00	7.0	2.2	1.8	0.00	6.60	0.00	0.00	0.00	0.00	
34-227	No	Asphalt	112.99			0.00	6.0	2.7	2.5	0.00	5.80	0.00	0.00	0.00	0.00	
34-228	No	Asphalt	113.83			0.00	6.0	2.1	1.7	0.00	5.60	0.00	0.00	0.00	0.00	
34-250	Yes	Asphalt	116.03	1.3	1.6	0.30	4.0	1.7	2.4	0.00	4.70	0.00	0.00	0.00	0.00	
34-251	No	Asphalt	116.85			0.00	6.0	1.4	1.4	0.00	6.00	0.00	0.00	0.00	0.00	
34-252	Yes	Asphalt	116.91	0.7, 1.5, 1.8, 2.2	1.0, 1.6, 2.0, 2.8	1.20	4.0	1.4	1.3	0.90	3.90	0.90	0.90	23.08	23.08	
34-253	No	Asphalt	117.85			0.00	5.0	1.4	1.4	0.00	5.00	0.00	0.00	0.00	0.00	
34-254	Yes	Asphalt	118.39	1.0	1.4	0.40	4.0	2.4	2.4	0.00	4.00	0.00	0.00	0.00	0.00	
34-255	Yes	Asphalt	118.78	1.1	1.5	0.40	3.0	1.0	1.0	0.40	3.00	0.40	0.40	13.33	13.33	
34-256	Yes	Asphalt	118.99	0.9, 1.4	1.2, 1.8	0.70	9.0	2.2	2.1	0.00	8.90	0.00	0.00	0.00	0.00	
34-257	Yes	Asphalt	118.88	0.9	1.3	0.40	4.0	2.0	2.0	0.00	4.00	0.00	0.00	0.00	0.00	
34-HA-1	Yes	Grass	115.37	1.0	1.4	0.40	1.4	0.0	0.0	0.50	1.40	0.50	0.50	35.71	35.71	
34-HA-2	Yes	Grass	114.75	0.9	1.3	0.40	2.2	0.0	0.0	0.40	2.20	0.40	0.40	18.18	18.18	
34-HA-3	Yes	Grass	114.13	0.3	1.0	0.70	1.0	0.0	0.0	0.40	1.00	0.40	0.40	40.00	40.00	
34-HA-4	No	Grass	113.73			0.00	1.4	0.0	0.0	0.00	1.40	0.00	0.00	0.00	0.00	
34-HA-5	Yes	Grass	113.50	0.4	0.8	0.40	1.4	0.0	0.0	0.40	1.40	0.40	0.40	28.57	28.57	
34-HA-6	Yes	Grass	113.16	0.4	1.4	1.00	1.4	0.0	0.0	1.00	1.40	1.00	1.00	71.43	71.43	
34-HA-7	No	Grass	114.61			0.00	1.4	0.0	0.0	0.00	1.40	0.00	0.00	0.00	0.00	
34-HA-8	Yes	Grass	115.21	0.8	1.0	0.20	1.4	0.0	0.0	0.40	1.40	0.40	0.40	28.57	28.57	
34-01	No	Asphalt	119.63			0.00	12.0	1.1	1.1	0.00	10.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-02	Yes	Dirt/Gravel	116.67	1.5	1.7	0.20	10.0	1.2	1.2	0.20	10.00	0.20	0.20	2.00	2.00	Depths corrected to true Ground Surface
34-03	No	Asphalt	110.84			0.00	12.0	0.0	0.0	0.00	10.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-03A	Yes	Asphalt	110.28	1.0	1.1	0.10	1.0	1.1	1.2	0.00	1.10	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-04	Yes	Asphalt	115.08	0.5	3.0	2.50	7.5	3.8	4.5	0.00	8.20	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-04A	Yes	Asphalt	115.63	1.5	1.6	0.10	5.0	3.1	4.3	0.00	6.15	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-04B	No	Asphalt	117.46			0.00	5.0	2.0	2.0	0.00	5.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-04C	Yes	Asphalt	114.52	1.5	2.0	0.50	5.0	3.5	4.0	0.00	5.50	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-05	Yes	Grass	118.45	1.2	5.2	4.00	12.0	6.9	5.8	0.00	10.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-06	Yes	Grass	116.95	1.2, 2.9	1.4, 3.2	0.50	5.0	3.7	4.4	0.00	5.70	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-07	Yes	Grass	118.31	2.2, 3	2.3, 5	2.10	7.0	2.4	1.3	2.00	5.90	2.00	2.00	33.90	33.90	Depths corrected to true Ground Surface
34-08	Yes	Grass	113.34	0.6, 2.6	2.1, 3.1	2.00	5.0	2.3	1.3	0.50	4.00	0.50	0.50	12.50	12.50	Depths corrected to true Ground Surface
34-09	Yes	Grass	112.79	0.7	1.2	0.50	3.0	2.2	1.2	0.00	2.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-10	No	Grass	112.65			0.00	3.0	2.4	1.9	0.00	2.50	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-11	No	Asphalt	114.10			0.00	3.0	1.6	1.6	0.00	3.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-11A	Yes	Asphalt	114.71	1.5, 2.4	2, 2.6	0.70	5.0	1.7	2.3	0.60	5.60	0.60	0.60	10.71	10.71	Depths corrected to true Ground Surface
34-12	Yes	Grass	118.03	0.2. 1.2, 2.9	0.7, 2.7, 4.2	3.30	10.0	5.0	4.7	0.00	9.70	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-13	Yes	Grass	114.72	1.0	2.0	1.00	6.0	2.2	0.8	0.00	4.60	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-14	Yes	Asphalt	119.30	2.5	5.5	3.00	10.0	2.8	2.5	2.70	9.70	2.70	2.70	27.84	27.84	Depths corrected to true Ground Surface
34-14A	Yes	Asphalt	119.34	4.0	5.5	1.50	10.0	2.8	2.5	1.50	9.70	1.50	1.50	15.46	15.46	Depths corrected to true Ground Surface
34-14B	Yes	Asphalt	119.33	2.5	3.5	1.00	3.5	3.5	3.1	0.00	3.10	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-15	Yes	Asphalt	119.64	2.0, 4.5	3.5, 5.5	2.50	8.0	0.6	0.6	2.50	8.00	2.50	2.50	31.25	31.25	Depths corrected to true Ground Surface
34-15A	Yes	Asphalt	119.59	1.5	1.9	0.40	5.0	2.1	2.1	0.00	5.00	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-16	Yes	Asphalt	119.71	2.0	4.0	2.00	10.0	2.2	2.2	1.80	10.00	1.80	1.80	18.00	18.00	Depths corrected to true Ground Surface
34-17	Yes	Grass	111.48	2.2	3.2	1.00	11.0	2.5	1.3	0.00	9.80	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
34-17A	No	Grass	112.35			0.00	1.5	1.9	0.3	0.00	-0.15	0.00	0.00	0.00	0.00	Depths corrected to true Ground Surface
OU9-01	No	Topsoil	NA			0.00	4.5	NA	NA	NA	4.5	NA	NA	0.0	0.0	Some coal chips 2-3" at 14"
OU9-02	No	Topsoil	NA			0.00	2.0	NA	NA	NA	2.0	NA	NA	0.0	0.0	
OU9-03	No	Topsoil	NA			0.00	2.0	NA	NA	NA	2.0	NA	NA	0.0	0.0	
OU9-04	Yes	Topsoil	NA	1.25, 5.0, 7.0	1.5, 5.05, 7.25	0.55	8.0	NA	NA	0.55	8.0	0.55	0.55	6.88	6.88	
OU9-05	No	fill material from drain	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	Near stormwater drain
OU9-05B	No	Topsoil	NA			0.00	7.0	NA	NA	NA	7.0	NA	NA	0.0	0.0	
OU9-06	No	Topsoil	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	

Notes:
1.) "*" in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" in Thickness of Ash Column represents that ash may be thicker than measured.
3.) "**" indicates max. overburden to 10 feet, see Methodology.

TABLE A-2
PERCENT ASH CALCULATIONS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION REPORT
PORTSMOUTH NAVAL YARD
KITTERY, MAINE

Boring Name	Ash/Burnt Material Observed	Ground Type	Pre-Excavation Ground Elevation (ft PNS Vert.)	Depth to Top of Ash/Burnt Material (ft BGS)	Depth to Bottom of Ash/Burnt Material (ft BGS)	Thickness of Ash/Burnt Material (ft)	Refusal Depth (ft BGS)	Excavated Thickness	Fill Thickness	Post-Excavation Ash/ Burnt Material Thickness	Total Depth of Overburden**	Minimum Estimated Ash/Burnt Material Thickness	Maximum Estimated Ash/Burnt Material Thickness	Minimum Ash/Burnt Material Percentage	Maximum Ash/Burnt Material Percentage	Comment
OU9-07	No	Concrete	NA			0.00	17.0	NA	NA	NA	10.0	NA	NA	0.0	0.0	
OU9-08	No	Concrete	NA			0.00	9.0	NA	NA	NA	9.0	NA	NA	0.0	0.0	
OU9-09	No	Concrete	NA			0.00	4.5	NA	NA	NA	4.5	NA	NA	0.0	0.0	
OU9-10	No	Topsoil	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-11	No	Topsoil	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-12	No	Topsoil	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-13	Yes	Topsoil	NA	6.7	7.4	0.70	8.0	NA	NA	0.70	8.0	0.70	0.70	8.75	8.75	
OU9-14	No	Topsoil	NA			0.00	10.0	NA	NA	NA	10.0	NA	NA	0.0	0.0	Coal pieces 6'-8.25'
OU9-15	Yes	Topsoil	NA			0.00	10.5	NA	NA	NA	10.0	NA	NA	0.0	0.0	Some coal pieces
OU9-16	No	Asphalt	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-17	No	Asphalt	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-18	No	Asphalt	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-19	No	Loam	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	Glass and terra cotta frags 1'-2'
OU9-20	No	Loam	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	Terra cotta frags
OU9-21	No	Loam	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
OU9-22	Yes	Topsoil	NA	6.5	7.0	0.50	8.0	NA	NA	NA	8.0	0.5	0.5	0.5	0.5	Slag, charred terra cotta, glass frags, tar like substance (7')
OU9-23	No	Topsoil	NA			0.00	4.0	NA	NA	NA	4.0	NA	NA	0.0	0.0	
OU9-24	No	Loam	NA			0.00	4.5	NA	NA	NA	4.5	NA	NA	0.0	0.0	Slag
OU9-25	No	Asphalt	NA			0.00	8.0	NA	NA	NA	8.0	NA	NA	0.0	0.0	
														Average	**Average**	
														4.3	**4.9**	

Notes:
1.) "*" in Thickness of Ash Column represents value used in Figures and EE/CA.
2.) "+" in Thickness of Ash Column represents that ash may be thicker than measured.
3.) "**" indicates max. overburden to 10 feet, see Methodology.

A.2 SOIL BORING LOGS

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-01
DATE: 4/22/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A											
S1	1		1.8/2		loose	dk brown	fine - med. gravel	GW	dry	0.0	0.0	0.0	0.0
	2					dk brown	fine - coarse sand	SW	dry				
S2	3		1.0/4		very				dry	0.0			
	4				- dense	gray	2" lens fine gravel	GP	dry				
	5					tan	fine sand, trace silt, trace gravel	SP	dry				
S3	6				very							0.0	0.0
	7		4.0/4		dense	tan	clayey silt - coarsens down to silt, trace fine sand, trace clay	ML	dry	0.0			
	8												
	9												
	10			- screened interval									
	11		1.8/2			tan	sandy silt, trace gravel	ML	dry	0.0			
	12								moist			0.0	0.0
				EOB									
									hard refusal at 12' - rock chips in nose				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: S1 = 34SS01000
S2 = 34SB010206
S3 = 34SB010610

Converted to Well: Yes ✓ No _____ Well I.D. #: TW-01

Well abandoned August 9, 2003
DSC 9/10/03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-02
DATE: 4/23/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S1	1		1.9/2		sl. loose	tan	fine-coarse sand, some fine gravel	SW		0.0	0.0	0.0	0.0
	2					black	ASH lens - 2" - fine-med. sand-sized charcoal						
						tan	fine-coarse sand, some fine gravel	SW					
S2	3		3.5/4			orange	fine sand, some silt, trace coarse sand, trace fine gravel	SP		0.0	0.0		
	4												
	5				dense	orange	silt, some fine sand	ML			0.0		
	6											0.0	0.0
S3	7		3.8/4		v. dense	orange	silt	ML		0.0	0.0		
	8												
	9										0.0		
	10												
				EOB			(refusal at 10')						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 34SS02000 = S1, S2=34SB020206, S3=34SB020610

Drilling Area Background (ppm): 0.0

Converted to Well: Yes X No ____ Well I.D. #: TW05

Well abandoned August 9, 2003
DJC
9/10/03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-03
DATE: 4/22/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S1	1		1.0/2		sl. loose	brown	fine-coarse sand, trace organics (roots)	SW	dry	0.0	0.0	0.0	0.0
	2				↓								
S2	3		2.0/4		sl. dense	brown	fine sand, some fine gravel, trace organics	SP		0.0	0.0		
	4								piece of slag at 4'				
	5										0.0		
	6					brown	fine sand, some fine gravel	SP				0.0	0.0
~~S3~~ TL 4/22/03	7				sl. loose	gray	med-coarse gravel and platy rock pieces (fine gravel-sized)	GW	← most likely riprap - not enough sed. (level with 3 attempts) to sample		0.0		
	8												
	9						8-10' no sample taken - trying to grind through coarse gravel layer				0.0		
	10												
	11						no sample recovery 10-12'				0.0		
	12			EOB									
							refusal at 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1 = 34SS03000, S2 = 34SB030206, ~~S3 - TL 4/22/03~~

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4689
DRILLING COMPANY: N/A
DRILLING RIG: (hand-augers)
BORING NUMBER: 34-03A *
DATE: 4/25/03
GEOLOGIST: J. Lambert
DRILLER: N/A

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
N/A	0	N/A											
					Sl-loose	brown	fine-coarse sand, trace gravel, some organics. (leaves, roots)	SW				0.0	0.0
	0.5									0.0	0.0		
	1	4/25/03				black	ASH - see below (1" lens)						
	1'					brown	fine-coarse sand, trace fine gravel	SW					
							refusal at 3 attempts at 1' - ~~large pc 4/25~~ coarse gravel clogging hand auger						
							ASH = fine-coarse sand-sized particles; crumbly						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * located 10' W of 34-03

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe

BORING NUMBER: 34-04
DATE: 4/23/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						asphalt = 6"						
S1	1		1.5/2		sl. loose	black	ASH - fine - coarse sand sized; fines downward to silty fine-coarse sand		v. dry, crumbles easily - charcoal sized ~~dry~~	0.0	0.0	0.0	0.0
	2									4/23			
S2	3		3.4/4							0.0	0.0		
	4					orange	silt, some clay	ML	moist				
	5										0.0		
	6				sl. dense	mottled lt brown/ orange	silt, trace clay	ML	moist			0.0	0.0
S3	7		1.0/1.5			orange-brown	fine sand	SP	dry	0.0	0.0		
						orange	silt, some clay	ML	moist				
	8				7.5' dense EOB	red-brown	very weathered rock / highly (refusal)		compacted silt				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: S1=34SS04000, S2=34SB040206, S3=34SB040608

Converted to Well: Yes X No ____ Well I.D. #: TW03

Well abandoned August 10, 2003
DJC
9/10/03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe

BORING NUMBER: 34-04A *
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
N/A	0	N/A											
	1		4.4/5		sl. loose	tan	fine-coarse sand	SW		0.0	0.0	0.0	0.0
						dk brown	fine sand	SP					
	2					black	ASH - see below		brick at 2'				
						lt brown	fine sand and silt, trace	SW	gravel				
	3					lt brown	fine-coarse sand, some gravel		(SW)				
					loose	dk brown	fine-med sand, trace silt	SW	(trace organics)				
	4				sl. dense	lt brown	fine sand and silt, trace gravel	SM					
	5								cobble at 5'				
							ASH = fine-coarse sand-sized, rounded, crumbly - 1" lens of material						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * location = 20' E of 34-04, next to building 63

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-04B*
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /FL) or Screened Interval	Soil Density/ Consistancy or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (pp Sample	Sampler BZ	Borehole	
N/A	0	N/A											
	1		3.5/5		sl. loose	lt brown	fine-coarse sand, trace fine gravel	SW		0.0	0.0	0.0	0.
	2					dk brown	fine-coarse sand, trace silt	SW					
	3					tan	silt, some fine sand, trace gravel	ML	cobble at 3.5'				
	4					tan	silt, some fine sand						
	5			5' EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * location = 50' E of 34-04, next to building 63

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe

BORING NUMBER: 34-04B 4/24 *C
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
N/A	0												
	1		3.0/5		sl. dense	lt brown	fine-med sand, trace fine gravel	(SP)		0.0	0.0	0.0	0.0
					↓	dk brown	silt						
	2				sl. loose	black	ASH - see below						
					sl. dense	dk brown	silt, trace fine gravel	ML					
	3						↓						
						tan	silt, some fine sand	ML					
	4												
	5			5' EOB	↓		↓						
							ASH = black fine-coarse sand-sized, crumbly, larger pieces (coarse sand sized) platy. Trace white med sand-sized material mixed in						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * boring located 6' N of 34-04, in the road

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-05
DATE: 4/23/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S1	1		1.1/2		sl. loose	lt brown	fine-coarse sand, some organics	SW	sl. moist	0.0	0.0	0.0	0.0
	2					black	ASH - fine-coarse sand and gravel sized pieces		dry; larger pieces shiny - charcoal (crumbly)				
S2	3		1.5/2			orange	lens (1") fine-coarse sand	SW	moist	0.0	0.0		
	4					black	ASH - crumbly + platy soft material (not shiny) - f-med sand-sized trace white med. sand-sized						
S3	5		1.5/2						particles (1' mixing zone)	0.0	0.0		
	6		~~TL 4/23/03~~			lt brown	fine-med sand and silt	SM				0.0	0.0
S4	7		1.2/2							0.0	0.0		
	8				sl. dense	gray/ orange	(mottled) silt, some clay	ML	moist				
S5	9		1.5/2			lt brown	silt, trace fine-med gravel, trace clay	ML	wet	0.0	0.0		
	10												
~~TL~~ 4/23/03 ~~S6~~	11		1.1/2							0.0	0.0		
	12					gray	rock fragments at end of liner ~~broken TL 4/23/03~~						
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: S1=34SS050002, S2=34SB050204, S3=34SB050406, S4=34SB050608, S5=34SB050810

Converted to Well: Yes X No ____ Well I.D. #: TW04

Well abandoned August 10, 2003
DJC
9/10/03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-06
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
*	0						top 0.2' = grass roots						
	1		3.0/5			lt brown	fine-coarse sand, trace gravel	SW	plastic layer at 0.5'	N/A	0.0	0.0	0.0
	2					black	ASH lens (2") - see below						
						tan	silt, some fine sand, trace gravel (ML)						
	3					black	3" lens soft platy material - not crumbly - poss. wood						
	4					tan	fine sand and silt - gets lighter in color and fines downward	SM					
	5			5' EOB									
							ASH - fine-coarse sand trace fine gravel - sized. no odor. crumbles easily; fragments rounded						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * no sample collected at this location

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-07
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A											
	1		2.5/5		sl. loose	lt brown	fine-coarse sand, trace silt, trace fine gravel	SW	dry; some organics (roots)	0.0	0.0	0.0	0.0
	2					dk brown	fine-coarse sand, trace silt, trace fine gravel	SW					
S1	3					black	1" lens ASH (1) see below						
						tan	fine sand, some silt	SP	~~trace gravel~~ 4/24/03				
S2	4					black	ASH - fine-coarse, some gravel-sized. Larger		1-2 mm patches prussian blue color				
	5						pieces platy with shiny surfaces. Some coarse-sand sized ~~pink~~ white material 4/24/03		on surfaces of 3 larger (gravel-sized) pieces - no other				
	6		1.8/2			tan	fine sand and silt	SM	prussian blue coloration observed	0.0	0.0	0.0	0.0
	7						↓		dry				
				EOB			refusal at 7'		MOIST				
							ASH (1) = fine-coarse sand-sized particles (black) - look like ground-up charcoal - crumbly.						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1=34CP070203, S2=34CP070305

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-08
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						top 0.1' = grass + roots						
	1				sl-loose	brown	fine-coarse sand, trace silt	SW	0.2' = fabric liner			0.0	0.0
						black	ASH - fine-coarse sand trace fine gravel-sized. platy, crumbles easily		(charcoal)				
SI	2									0.0	0.0		
	3					brown	fine-coarse sand, trace gravel	SW					
						black	ASH - similar to ash above						
	4					brown	fine-coarse sand, some gravel	SW					
	5												
				5' EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: SI = part of composite sample 34CP08090103

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-09
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S1	1		2.6/3		dense	brown	fine-coarse sand, some silt	SW					
					lt. brown	black	fine sand and silt, some		ASH *	0.0	0.0		
	2					lt brown	fine sand and silt	SM	dry			0.0	0.0
	3			3' refusal	v.dense		↓						
							(3' refusal for 4 attempts)						
							* ASH = fine-coarse sand-sized (trace gravel-sized)		crumbly black				
							particles - larger pieces platy texture (black)		have ~~shiny/lt~~ 4/24/03				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1 = part of composite sample 34CP08090103

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-10
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD *	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1		30/36"		dense	lt brown	fine-coarse sand, some fine gravel	SW		0.0			
	2				dense	lt brown	silt, trace clay, trace fine gravel	ML			0.0	0.0	0.0
	3			EOB 3'	dense				moist				
							3' refusal (2 attempts) - rock fragments in nose of macrocore liner.						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: No sample taken at this location*

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-11
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
*	0												
	1		34"/36"		v. loose / v. loose	lt brown / lt brown	med-coarse sand, fine-coarse sand,	SW	some gravel	0.0	0.0	0.0	0.0
	2				dense		some gravel, trace silt	SW					
	3				v. dense	lt brown	fine-coarse sand, some gravel	SW					
				EOB									
							3' refusal after 2 attempts						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * no ash; no sample taken at this location

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe

BORING NUMBER: 34-11A *
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
*	0	N/A											
	1		4.5/5		v. loose	gray	fine-coarse sand, some fine gravel	SW	v. dry			0.0	0.0
	2					dk brown	silt, some fine sand	ML	v. dry	0.0	0.0		
						black	ASH - see below (1)						
	3					tan	silt, trace fine sand, trace gravel	ML	v. dry				
						black	ASH - see below (2)						
	4					tan	silt, trace fine sand, trace gravel	ML	v. dry				
	5			5' EOB	loose	lt. gray	fine-coarse sand and gravel	SW	v. dry (odorless)				

ASH = fine-coarse sand-sized, rounded, brittle, crumbly (1)

(2) 1" lens ASH - platy (shiny). fine-coarse sand, trace gravel-sized. (charcoal)

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: boring for extent only - no sample taken
* location = 10' W of 34-11

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-12
DATE: 4/23/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						(grass layer 0-2")						
S1	1		0.9/2		sl. loose	Black	ASH-fine-coarse sand, some fine		gravel-sized pieces (charcoal)				
						brown	fine-coarse sand	SW		0.0	0.0	0.0	0.0
	2					black	ASH - same as above		dry				
						black/ orange	mottled ASH - silt, some fine (mixed layer)		sand				
S2	3		1.0/2			orange	2" lens fine-coarse sand	SW	trace metal	0.0	0.0		
	4					lt brown/ black	mix ASH and silt, trace fine sand. See above		pieces (coarse sand sized) for ash details				
S3	5		1.1/2		sl. dense	lt brown	fine sand and silt, trace	SP	TT 4/23 dry	0.0	0.0		
	6						fine gravel - no ash visible	SM	cobble at 6' moist			0.0	0.0
S4	7		1.5/2							0.0	0.0		
	8				dense				cobble at 8'				
S5	9		1.2/2							0.0	0.0		
	10			10' EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1=34SS120002, S2=34SB120204, S3=34SB120406, S4=34SB120608, S5=34SB120810

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe

BORING NUMBER: 34-13
DATE: 4/23/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S1	1		1.2/2		sl. loose	lt brown	fine-coarse sand, trace	(SW)	fine gravel, trace silt				
						black	ASH - (fine-coarse sand size) on largest pieces		shiny (charcoal)				
	2					orange	fine sand, some silt	SP	cobble at 1.5'				
S2	3		1.5/2			gray brown	fine-coarse sand, some fine gravel; crumbly	SW	very dry				
	4				dense								
S3	5		1.1/2										
	6			refusal 6.0'									
							note - made 3 attempts - all refused at 6'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1=345S130002, S2=345B130204, S3=345B130406

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-14
DATE: 4/22/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A											
S1	1		1.5/2		sl. loose	brown	fine-coarse sand and gravel (SW)		dry	0.0	0.0	0.0	0.0
	2					lt brown	fine-coarse sand, trace gravel (SW)						
S2	3		2.0/4			black	ash (burnt material)-			0.0	0.0		
	4						fine-coarse sand-sized charcoal pieces						
	5						↓		brick at 5'		0.0		
	6				↓	tan	silt, trace gravel	ML		0.0			
S3	7		3.4/4		dense	tan	silt, trace fine sand	ML	dry		DP	0.0	0.0
	8						coarsens downward to silt, some fine sand						
	9				very dense	tan	till-silt, some fine sand, some fine gravel	ML			0.0		
	10								dry				
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1= 34SS14000, S2= 34SB14020, S3= 34SB140610

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No ✓ Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-14A *
DATE: 4/25/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
N/A	0	N/A											
	1		3.0/5		loose	lt brown	fine - coarse sand, some gravel	SW	dry				
	2				sl. loose	lt brown	fine sand, trace gravel	SP					
	3												
	4					black	fine sand, some silt, some wood pieces (black outside, not burned/ stained when broken)	SP	sl. petroleum odor - stained soils, no evidence of free product				
	5												
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * located 10' W of 34-14

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-14B*
DATE: 4/25/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
N/A	0												
	1		2.2/3.5		sl. loose	gray	coarse sand and gravel	SW		0.0	0.0	0.0	0.0
	2				sl. dense	lt brown	fine - coarse sand	SW					
	3				↓	black	fine-med sand, trace fine gravel - stained soil (no sign of ash)	SP					
	4			3.5' refusal	- ↓ -	dk brown	fine sand, some silt, trace fine gravel (SP)						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * located 15' S of 34-14

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-15
DATE: 4/22/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0						asphalt = top 0.5'						
S1	1		1.4/2		dense	lt brown	fine sand and silt	SM	dry	0.0	0.0	0.0	0.0
	2				sl. loose	black	ASH - fine-coarse sand,						
S2	3		3.0/4				trace fine gravel-sized charcoal pieces			0.0	0.0		
	4					brown	fine-coarse sand	SW					
	5					black	ASH - same as above						
S3	6				v. dense	orange	fine sand	SP	extremely dry - crumbles easily	0.0	0.0	0.0	0.0
	7		1.5/2										
	8			EOB							0.0		
							refusal at 8' (3 attempts)						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: S1=345S15000, S2=345B15020, S3=345B150610

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Envi. Services
DRILLING RIG: Geoprobe

BORING NUMBER: 34-15A *
DATE: 4/25/03
GEOLOGIST: S. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows/6" or RQD (%)	Sample Recovery/Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sample 1/2	Sample 3/4	Sample Top
N/A	0	N/A	N/A				top 0.5' = asphalt						
	1		3.5/5		sl. dense	lt brown	fine-med sand, trace silt	SP	dry	0.0	0.0	0.0	0.0
	2					black	4" lens ASH - fine-coarse sand-sized pieces						
	3					brown	fine-coarse sand						
	4					orange	fine sand, some silt	SP					
	5												
				EOB									

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: * located 10' SW of 34-15. Unable to move further away to find clean material due to utilities.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-16
DATE: 4/22/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1		0/4/2				coarse gravel - no	GW			0.0	0.0	0.0
	2		4/22				recovery ↓						
S1	3		3.5/4		loose	black	ash - fine - coarse sand,			0.0			
	4						trace gravel-sized pieces		piece of slag at 4'		0.0		
	5				loose	tan	silt, trace fine sand	ML					
S2	6				sl. loose		↓					0.0	0.0
	7		3.0/4			tan	1" lens - fine sand, some silt, trace fine gravel	SP		0.0	0.0		
	8					tan	silt, trace fine sand	ML					
	9						↓						
	10					tan	silt, some clay	ML			0.0		

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: S1=34SB160206, S2=34SB160610

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Env. Services
DRILLING RIG: Geoprobe
BORING NUMBER: 34-17
DATE: 4/24/03
GEOLOGIST: J. Lambert
DRILLER: E. Thomas

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /FL) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
S1	1		1.1/2		0.5' si-loose	lt brown	fine-coarse sand	SW					
						gray	med. gravel lens (2")	GP	dry	0.0	0.0	0.0	0.0
	2					lt brown	fine-coarse sand, some fine gravel	SW					
S2	3		2.5/4			black	ASH - fine-coarse sand-sized, crumbly, rounded, trace coarse sand-sized material (white)			0.0	0.0		
	4					brown	fine sand, some silt trace coarse sand, trace gravel	SP	dry				
	5										0.0		
	6											0.0	0.0
	7		0.2/4		loose	gray	coarse gravel - poor recovery	GP		0.0	0.0		
	8												
	9										0.0		
	10								dry				
	11		0.0/1				no recovery				0.0	0.0	0.0
				refusal									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: S1=34SS170002, S2=34SB170206

Converted to Well: Yes X No ____ Well I.D. #: TW02

Well abandoned August 10, 2003
DJC 9/10/03

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PORTSMOUTH
PROJECT NUMBER: 9089
DRILLING COMPANY: N/A
DRILLING RIG: (hand augers)
BORING NUMBER: 34-17A*
DATE: 4/25/03
GEOLOGIST: J. Lambert
DRILLER: N/A

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth /Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole **	Driller BZ**
N/A	0												
					sl. loose	dk brown	fine-coarse sand, some gravel, trace organics - no indications of ash	SW		0.0	0.0	0.0	
	1.5'			1.5' refusal									
							refusal after 2 attempts (coarse gravel and cobbles at 1.5')						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: *located 10' E of 34-17. Note - had to hand-dig due to unmarked utility lines

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig

BORING No.: 34 - 100
DATE: 4-24-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ**	Borehole**	Drillers BZ**
	0	N/A					Asphalt surface						
				Asphalt	Loose	Gray	ASPHALT & GRAVEL		Fill material; dry				
	0.7						(fine+coarse subang. gravel to 1")		Roadbase gravels				
				Silt-Sand-Gravel-Mixture	Loose	Red Brn	GRAVEL - SOME SAND	GW	Fill material; dry				
							(fine+coarse subang+subrnd						
	1.2						gravel to 1", fine-med sand tr. coarse sand, poorly graded)						
S-1					Loose	Very Red-Brn	SILTY SAND - SOME GRAVEL	SM	Fill material; dry				
							(fine-med sand, tr. coarse sand						
	2		3.3' / 4'				fine subang gravel to ½")						
					Denser	Tan brown	SILTY SAND - TR GRAVEL	SM	Fill material; dry				
							(fine sand, poorly graded,						
	2.8				Loose	tan brn	subang. gravel to ¾")						
					↳	↳	SAND & GRAVEL - TR SILT	SP-SM	Fill material; dry				
							(coarse ang-subang gravel,						
							quartzite rock fragments						
	3.3		2.5'				fine sand, poorly graded)						
									Partial recovery.				
							?		Fill soils were compressed or the frictional forces between the				
									material and the acetate liners were				
	4								not strong enough to keep the materials in				
S-2							SAND - SOME GRAVEL	SP					
			0.7 / 1'				fine sand, tr. med sand, poorly						
	4.7						graded, fine/coarse subang. gravel to 1"						
	5								EOB @ 5' - Refusal				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No burn material observed @ location
No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (do DT tracked rig

BORING No.: 34 - 101
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Grain size, sorting, etc.)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ**	Borehole**	Driller BZ**
	0	N/A											
				Sand + Gravel	Loose	Gray-Brn	SAND & GRAVEL - TR SILT	SW	Fill soil; damp				
							(fine-coarse sand, well graded, fine, subang						
	0.3						to subrounded grav. to 1/2")						
				Burn Material	Loose	Black	BURN MATERIAL	SW/FILL	Fill material;				
							(major components: charcoal		dry				
							clinkers, furnace slag,						
							ash, red nodules (slag?)						
S-1							mixed w/ fine to coarse sand						
	0.8						sized particles						
				Silt-Sand-Gravel Mixture	Denser	Dk red-brn	SILTY SAND - TR GRAVEL	SM	Fill soil; damp				
			2.1 / 3'				(fine-med sand, poorly						
	1.6						graded, trace fine gravel to 1/2")						
					Loose	Gray-Brn	SAND & GRAVEL - TR SILT	SW-GW	Fill soil; dry				
							(fine-coarse sand, well						
							graded, fine/coarse ang.						
	2.1						gravel, pulverized rock)						
									Partial recovery.				
							?		Fill soils were either				
									compressed or the				
									frictional forces				
									between the material				
									and the acetate				
									liner were not strong				
									enough to keep the				
									materials in.				
	3'			EOB			Refusal @ 3'		EOB @ 3'				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: Burn material observed 0.3-0.8' (thickness = ~0.5') from top of liner
No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance Ce DT tracked rig

BORING No.: 34-102
DATE: 4-29-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Geologic Description)	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ**	Borehole**	Borehole BZ**
	0	N/A											
				Silt-Sand-Gravel Mixture	Loose	Gray-Brn	SAND & GRAVEL	SW-GW	Fill soil; dry				
							f-coarse sand, well graded f to c. subrounded gravel						
	0.6						to 1"						
					Denser	Brn	SILTY SAND - SOME GRAVEL	SM	Fill soil; dry				
							(f-coarse sand, well graded,						
	1						fine angular grav. to 1/2")						
				Burned Material	Loose	Black Red +	BURN MATERIAL	SW FILL	Fill; dry; no				
			2.7' / 4'			Brown	(major components: charcoal		visible white to off-white ash				
S-1							clinkers, furnace slag,						
							red nodules (furn slag?)						
							to 1/2") mixed w/ f-coarse						
	1.5						sand sized particles.						
				Silt-Sand-Gravel Mixture			SILTY SAND - TR GRAVEL	SM					
							(fine sand, poorly graded,						
	2.3						fine gravel to 1/2", subrnd)						
					Loose	Tan Brn	SILTY SAND - SOME GRAVEL	SM					
							(f. sand, poorly graded, fine						
	2.7'						+ coarse gravel to 1", subang + subrounded)						
									Partial recovery - compressed soil or not enough friction to keep material in liner				
							?						
	4				Loose	orange brn	SILTY SAND - ROCK FRAGS		wet				
			0.5' / 1'				(quartzite rock frags mixed w/ fine sand, poorly graded)						
S-2	4.5												
	5						Refusal @ 5' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: Burn material observed 1-1.5' from top of liner (S-1) (Thickness = 0.5')
No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig
BORING No.: 34 - 103
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Driller BZ
	0	N/A					Asphalt surface						
	0.2				Loose	Blk	Asphalt Chunks		Fill; dry				
				Burned Material			- BURN LAYER -	SW Fill	Fill; dry				
							(Major components:						
							charcoal clinkers, ash,						
							furnace slag, red						
							nodules (forn. slag?)						
	0.7						Mixed w/ fine-coarse sand sized particles)						
				Silt-Sand-Gravel Mixture	Dense	Red Brn	SILTY SAND - TR GRAVEL	SM	Fill; dry				
			3'/4'				(f-med sand, f. gravel						
S1	1.7						to 1/2"; subangular)						
					Loose	White	BROKEN ROCK - quartz		Fill; dry				
	1.9						gravels/fragments to 1.5"						
						Tan-Brn	SAND - TR SILT - TR GRAVEL	SP	Fill; dry				
							(f-med sand, 1-2 pieces						
	2.8						fine subang. gravel to 1/2")						
						DK Gray	GRAVEL - ROCK FRAGS	SP	Fill; dry				
	3						(fine gravel; quartzite frags)						
									Partial recovery compressed fill collapsed or not enough friction to keep material in liners				
	4					?	?	?					
						Tan Brn	SILTY SAND - TR GRAVEL	SM	damp; fill				
	4.1						f-med sand, f-gravel to 1/2" subangular						
S2			0.8'	Burned Material		Black	BURN LAYER - charcoal clinkers, furnace slag, red	SW Fill	Real (?) or cave-in material (?)				
	4.3						nodules in f-c sand matrix						
	4.8			Silt-Sand-Gravel	Denser	Tan Brown	SILTY SAND - TR GRAVEL (f-c sand, f. angular grav to 1/2")	SM	Fill; damp				
	5				Loose		GRAVEL ONLY		Refusal @ 5' - EOB				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: 2 intervals of burn material observed: 0.2-0.7' from top of S-1 liner; 4.1-4.3' relative to 1st liner - 2nd interval may possibly be cave-in material - can't tell.

Converted to Well: Yes ____ No X Well I.D. #: ____

No cultural artifacts observed

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-104
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Asphalt, Soil, etc.)	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE MAT.	Fill	Fill; dry				
	0.8						(f-coarse sand, well graded, fine ang. gravel to ½")						
				Burned material-Clinkers		Blk	BURNED MATERIAL -	Fill	Fill; dry; no ash				
	0.9						(visible charcoal clinkers only)		furn. slag or nodules observed				
			1.8'			Orange Brn	SILTY SAND - TR GRAVEL	SM	Fill; dry				
S-1			4'	Silt-Sand-Mixture			(f. sand, poorly graded						
	1.3						(coarse gravel, subang., to 1")		Fill; damp				
	1.8				Denser	Tan Brn	- similar to above (except, more dense)						
				?	?	?	?		compressed soil or not enough friction to hold mat. in liner				
	4												
				Silt-Sand-& Gravels	Loose	Brn	SILTY SAND - SOME GRAVEL	SM	Fill; dry				
							(f-med sand, poorly graded, f+coarse subrnd+subang gravel to 2", brick pieces						
	5.5												
S-2					Loose	Gray	GRAVEL - (coarse	GP	Fill: dry				
	5.9		2.5'				subrounded gravel to 2") poorly graded						
			2.5'		Loose	Tan-Brn	SILTY SAND - SOME	SM	Fill: dry				
							GRAVEL (f-med sand,						
							poorly graded, f. gravel,						
							subangular to ½", brick						
	6.5					Red	pieces @ bottom						
				EOB - refusal			EOB @ 6.5' - refusal						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: Partial recovery for S-1. Soils compressed or frictional forces not strong enough to withhold soils in ~~co~~ liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

g 4-24

Burned interval - 0.8-0.9' from top of S-1 liner (limited to charcoal clinkers)

No cultural artifacts observed.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig

BORING No.: 34-105
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole**	Driller BZ
	0	N/A											
				Asphalt roadbase	Loose	Gray Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
	0.7						(f. gravel, poorly graded, angular to 1/2")						
					Loose	Red-Brn	SILTY SAND - SOME GRAVEL	SM	Fill; dry-damp				
							(f. sand, poorly graded, coarse						
	2.1		3.4'	Silt-Sand-Gravel Mixture			subangular gravel)						
S-1			4		Loose	Tan-Brn	- similar to above w/		Fill; dry; crumbly				
	3.4						less gravel (trace)		soil				
					?	?		?	Partial recovery - soils compressed or frictional forces not strong enough to hold fill soils in liner				
				?			?						
	4												
					Loose	Gray	GRAVEL - SOME SAND	GW	Fill; very dry				
							(f-c gravel, subang-subrnd to 2"; f-coarse						
	5.2			More gravel than sand			sand, well graded, brick pieces)						
						Tan-Brn							
S-2			2.5'				- similar to above						
			3'				w/ more brick @ bottom						
	6.5												
									Partial recovery - soils compressed or frictional forces not strong enough to hold fill soils in acetate liner				
				?			?	?					
	7						EOB @ 7' refusal						
				EOB - refusal									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No intervals of burned material observed.
No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig
BORING No.: 34-106
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole **	Driller BZ
	0	N/A											
	0.7			Asphalt + Roadbase	Loose	Gray-Blk	ASPHALT SURFACE	Fill	Fill; dry				
							GRAVEL ROADBASE (f-coarse sand, well graded, f. gravel to 1/2", angular)						
	1.0												
				Burned Material	Loose	Blk	BURNED MATERIAL	GW Fill	Note - no visible odor while to white ash observed in mixture.				
S1			3'/3'				(major components - charcoal						
							Clinkers, furnace slag mixed		Fill; dry				
							w/ f-c sand size particles						
	1.5						+ f. ang. gravel to 1/4")						
				Silt + Sand	Denser	Red-Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
							(f-med sand, tr. coarse						
							sand, f. gravel to 1/2", subangular)						
	2.3			Silt + Clay	Stiff	Red-Brn	SILT & CLAY - TR GRAVEL	ML	Fill (?); damp				
							(silt/clay sized particles,						
	3'						coarse, subang. gravel, to 1/4")						
				EOB @ 3'			Refusal @ 3'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: Burned material observed from 1-1.5' below top of liner. No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig

BORING No.: 34 - 107
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole**	Drill BZ
	0	N/A			Asphalt surface								
	0.5			Asphalt + Roadbase material	Loose	Blk-Gray	ASPHALT CHUNKS	Fill	Fill; dry				
					Loose	Dk Brn	ROADBASE MATERIAL						
	1						(f-c sand, well graded, f-c ang. gravel, tr. silt)						
				Silt-Sand-Gravel Mix	Denser	Red-Brn	SILT-SOME SAND-SOME GRAVEL	SM	Fill; damp				
			2.4'/4'				(f-c sand, well graded, f-c angular gravel to 1", bark pieces)						
S1	1.5				Denser		SILT-SOME SAND-SOME GRAVEL-TR CLAY		Fill; damp				
							(f-m sand, poorly graded, coarse subang-subrnd gravel to 2" Gray sized particles)						
	2.4												
				?		?	?	?	Partial recovery - soils well compacted too gravelly for capture or frictional forces not strong enough to hold soils in liner.				
	4												
				Sand + Silt Mix less gravel	Denser	Red-Brn	SAND-SOME SILT-TR GRAVEL	SP-SM	Fill; dry				
							(f-med sand, poorly graded, coarse subrnd grav to 1")						
	5.3		2'/3'			Tan-Brn	- similar to above						
S2	6												
				?		?	?		Partial recovery - see remark above				
	7						Refusal @ 7'. EOB						
				EOB @ 7' refusal									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No intervals of burned material observed
No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 108
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample FZ	Borehole **	Drill FZ
	0	N/A			Asphalt surface								
				Asphalt	Loose	Blk	ASPHALT CHUNKS	Fill	Fill; dry; crumbly				
	1.5			Roadbase									
					Loose	Brn	ROADBASE MATERIAL		Fill; dry				
	2.1						(f-c sand, well graded, f-c subang gravel to 1.5")						
S-1			2.6'	Silt-Sand Gravel Mix			SILTY SAND - SOME GRAVEL	SM	Fill; damp				
	2.5		4'		Loose	Red-Brn	(f-m sand, poorly graded)		(fines holding H2O)				
				Mostly Silt	Stiffer	Brn-Red	SILT - TR GRAVEL - TR to SOME CLAY	ML	Fill; damp-wet				
	2.6				Dense		(brick pieces)		(fines holding H2O)				
				?	?	?	?		Partial recovery				
	4								Compressed upper soils? too gravelly?				
				Mostly Silt	Dense	Brn-Red-Brn	SILT - SOME CLAY - TR SAND	ML	Fill; saturated				
							(f. sand, poorly graded,		(fines holding H2O)				
	5						clay-sized particles)						
			2'	Silt-Sand-Grav. Mix	Loose	Gray-Brn	SILTY SAND - TR GRAVEL	SM	Fill; dry				
S-2			4'				(f-med sand, poorly graded,						
	6						coarse gravel to 1.5", subangular, brick frag)	?					
				?	?		?		Partial recovery - soils compressed, too gravelly to capture or forces not strong enough to hold soils in liner				
	7												
				EOB @ 7'			Refusal @ 7'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No burned material observed. Location on mound of asphalt south side of bldg complex. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 109
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A					Asphalt Surface						
				Asphalt + Road Base Material	Loose	Gray	ASPHALT PIECES (F→C)	Fill	Fill; dry				
	1.4				↓	Blk	↓ - similar to above	↓	↓				
	1.9				Denser	↓	↓ - second layer of asphalt						
					Loose	Gray	- ROADBASE MATERIAL -						
	2		3'/4'		↓	↓	(coarse subang gravel to 1", quartzite frags.)						
S-1					Loose	Red Brn	GRAVEL - SOME SAND						
					↓	↓	(f-m sand, poorly graded, f+c subrnd gravel 1/2-1.25"						
	3												
				?	?	?	?		Partial recovery - compressed soils, too gravelly to capture, or forces not strong enough to hold in liner				
	4				↓	↓	↓	↓					
				Sand + Gravel	Loose	Red-Brn	SAND - SOME GRAVEL	SP	Fill; dry				
					↓	↓	(f-m sand, poorly graded, f+c subang. gravel to 1" quartzite rock chips)	↓	↓				
	4.8												
					Loose	Gray	GRAVEL - coarse subang to angular gravel	GP	Fill; dry				
S-2	5		2'/4'		↓	↓		↓	↓				
				Silt - some sand	Dense/ Stiff	Red-Brn	SILT - SOME SAND	ML	Fill; saturated				
							(f. sand, poorly graded, quartzite rock chips)		(fines holding H2O)				
	5.6				↓	↓		↓					
				Silt - sand - Gravel	Less Dense	Tan Brn	SILTY SAND - fine - med sand, poorly graded	SM	Fill; damp				
	6				↓	↓		↓					
					?	?	?	?	Partial recovery - see remarks above				
	8				↓	↓	↓						
							SAND & GRAVEL	SW-GW	Fill; damp				
S-3							(f-c sand, well graded, f+c subang - subrnd gravel, quartzite frags)						
	9							↓	↓				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No burned material observed. Drill location on mound of asphalt on southside of bldg complex. No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (do DT tracked rig

BORING No.: 34 - 109
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: B. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Borehole BZ
	9	N/A											
				Silt-Sand-Gravels	Loose	DK. Gray	BROKEN ROCK- QUARTZITE		Fill; damp				
	9.4												
						Brn	SAND & GRAVEL w/ quartz nodules (wht) (pegmatite)						
	9.6												
			3/3'		Denser	Brn	SILTY SAND-TR GRAVEL		Fill (?); damp				
S-3							(Mostly f-m sand, 2 pieces subang-subrnd gravel to 1½")						
	10.7												
				Till (?)			SILT- SOME SAND- TR GRAVEL		Possible Till Layer (Native)				
						Red Brn	(Mostly silt, f. sand, poorly graded, f+c angular gravel		Saturated				
	11												
				EOB @ 11' - refusal			Refusal @ 11' - EOB						

KJ 4-23

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: See comments page 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34 - 110
DATE: 4-23-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification Asphalt + Stone	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT PIECES	Fill	Crumbly; Fill				
	0.5					Dk brn	ROADBASE MATERIAL						
	2						(f-c sand, well graded, f-c subang gravel to 1")						
S-1			2.8'	Gravel + Silt	Dense	Red Brn	GRAVEL - SOME SILT - TR SAND	GM	Fill; damp				
	2.8		4'				(f-m sand, poorly graded, angular to subang gravel to 1"		(fines holding H2O)				
				?	?	?	?	?	Partial recovery - fill soils too gravelly to capture (?)				
	4												
				Silt-clay or clayey silt	Soft	Brn	SILT - SOME CLAY (sized particles) - TR GRAVEL	ML	Fill (?); Saturated (fines)				
	5		2.1'				(Mostly silt, coarse subang. gravel to 1")						
S-2			4'	Silty-Sand	Dense	Tan Brn	SILTY SAND - TR GRAVEL (c. gravel, poorly graded, to 1" - w/ inclusions)	SM	Fill (?); dry				
	6.1						subang - sub rnd						
				?	?	?	?	?	Partial recovery				
	8												
				Silt-Sand-Gravel	Dense	Brn	SILTY SAND - SOME GRAVEL (f-m sand, poorly graded, f-c subang - subrnd gravel)	SM	Fill (?); dry				
	9.6		2'										
S-3			2'	clayey silt	Dense	Brn	SILT - SOME clay sized particles - TR GRAVEL (Coarse subang. gravel to 1.5"; quartzite chips)	ML	Fill (?); Saturated (fines)				
	10'								EOB @ 10' - rock				
				EOB @ 10'			Refusal @ 10'		Frap @ bottom				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No burned material observed. Drill location on asphalt mound on southside of bldg complex. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance Cobra DT tracked rig
BORING No.: 34 - 111
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample#	Sample BZ	Borehole**	Drill FBZ**
	0	N/A					Asphalt surface						
				Asphalt + Road Base	See Remarks	Gray Blk	ASPHALT	Fill	Crumbly to slightly				
	1.5						- multiple layers		Plastic; dry; Fill				
					Loose	Brn	ROAD BASE MATERIAL		Fill; dry				
							(f-c sand, well graded, f-c subrnd gravel to 1";						
S-1	2.3		2.8'				rock fragments)						
			4'	Gravel w/silt		Red Brn	GRAVEL - SOME SILT	GM	Fill; damp				
	2.8						(coarse subang gravel to 1.25", quartzite frags)		(fines holding H2O)				
				?	?	?	?		?				
	4												
				Gravel-Sand-Silt	Loose	Brn-Gray Brn	GRAVEL - SOME SAND - SOME SILT	GM	Fill: damp (fines)				
							(f-m sand, tr. coarse sand, poorly graded, coarse						
	4.9		2.4'				angular gravels to 1.25")		8-4-23				
			4'	Clayey Silt	Soft	Red Brn	SILT/CLAY sized - TR SAND	ML	Fill (?) Saturated (fines)				
	6						(f. sand, poorly graded)						
S-2				Silty Sand	Loose	Tan Brn	SILTY SAND	SM	Fill; dry;				
	6.4						(f. sand, poorly graded)		crumbly relative to silt layer above				
				?			?		Partial recovery -				
									compressed soil; too gravelly to capture or				
	8								forces not strong enough to hold contents in liner				
				Sand + Gravel Mix	Loose	Brn	SAND & GRAVEL - TR SILT	SW-GW	Fill; dry (?)				
							(f-c sand, well graded, f-c subang gravel						
	8.9						to 1.25")						
S-3			3.6' / 4'		Denser (packed tight)	Brn	SAND - SOME GRAVEL - TR SILT	SP-GP	Fill; dry (?)				
							(f-m sand, poorly graded, coarse gravel to 1.5", f gravel (trace)						
	11.6						to 1/2",		Partial recovery - no soil 11.6-12'				

Refusal @ 12' - EOB

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Refusal @ 12'. No burned material observed. No cultural artifacts observed. Drill location on east edge of asphalt mound - South side of bldg complex.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (60DT tracked rig

BORING No.: 34 - 112
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole BZ	Drillers BZ
	0	N/A											
				Asphalt + Road Base	Loose	Blk	ASPHALT PIECES	Fill	Fill; dry				
	1.5												
						Dk Brn	ROADBASE MATERIAL		Fill; wet (fines)				
	2						(GRAVEL - SOME SILT)						
S-1			2.5'	Burned Material			BURNED MATERIAL		Fill; dry				
			4'		Loose	Blk	(Charcoal clinkers, scattered,		clinkers to 1/2"				
	2.5						mixed w/ f-c sand size material, brick pieces)						
				?	?	?	?	?	Partial recovery - compressed soil or too				
	4								gravelly, loose to capture or frictional forces				
	4.5			Gravel	Loose	Gray	GRAVEL	GP	not strong enough to hold contents in liner				
				Silt, f-sand	Dense/ Stiff	Gray-Brn	SILT - TR SAND - TR GRAVEL	ML	Saturated (fines)				
S-2			2.3'				(f. sand, poorly graded,						
	6.3		4'				coarse, subang. gravel to 3/4")						
				?	?	?	?	?	Partial recovery - compressed soil (?)				
	8												
				Silts-Sand-Gravels	Dense	Red-Gray Brn	SILTY SAND - SOME GRAVEL	SM	Fill; damp				
							(f-m sand, poorly graded,		Mottled coloration				
S-3	11.2		4'				f-c subrounded gravel to 1")						
			4'		Loose	Blk-Brn	GRAVEL - SOME SAND - SOME SILT	GM	Fill (?); saturated				
							(f-c sand, well graded,						
	12						coarse gravel, subang + subrnd to 1.5")						
				EOB @ 12'			EOB @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: Ended boring @ 12' bgs (not a refusal). Burned material (mostly clinkers) observed 2-2.5' from top of S-1 liner. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34 - 113
DATE: 4-23-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Relative Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray	ASPHALT & ROADBASE	Fill	Fill; dry				
	1.3						(f+c gravels, subang. to 1")						
				Burned Material	Loose	Black	BURNED MATERIAL -		Fill; dry				
							(trace charcoal clinkers mixed w/ f-c sand,		oxidized sands				
S-1			2.3'				well graded, f. gravel to						
	1.7		4'				1/2") (NO ASH OBSERVED)						
					Loose	Red-Brn	clinkers / ash observed						
							(<5 charcoal clinkers						
							to 3/4" visible; crumbly;						
	2.3						mixed w/ off-white ash)						
				?	?	?	?	?	Partial recovery -				
	4								soils too loose for capture				
				Silty Gravels	Loose	Brn	GRAVEL - SOME SILT/CLAY	GM	Fill; saturated				
							(coarse, subang. gravel		(fines)				
S-2	5.4		1.4' / 4'				3/4-1"; clay-sized particles)						
				?	?	?	?	?	Partial recovery - soils too loose for capture				
	6								void observed by driller				
	8								(sudden drop in tools)				
				Clayey Silt	Dense	Gray-Brn	SILT / CLAY (sized particles)	ML	Native (?)				
	11.5		4' / 4'						(mottled coloration)				
S-3				Rock Frag	Loose	DK Gray	BROKEN ROCK	Rock					
							(angular quartzite frag)		Native (?) -				
	12								dry; crumbly				
				EOB @ 12' - Refusal			Refusal @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: Burned material observed 1.3-2.3' from top of S-1 liner. Primarily clinkers (1.3-1.7'); clinkers + ash (1.7-2.3'). No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Void observed by driller in S-2 interval (4-8') - sudden drop of tools w/ little recovery.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-114
DATE: 4-23-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample	Borehole	Drill Rig
	0	N/A					Asphalt surface						
				Asphalt Roadbase	Loose	Blk-Gray	ASPHALT & ROADBASE (c angular gravel to 1")	Fill	Fill; dry				
	1												
				Silt-Sand-Gravel	Denser	Brn-Red	SILTY SAND - SOME GRAV. (f-m sand, poorly graded, ang. gravel to 1")	SM	Fill; Moist				
	1.6												
				Mostly sand w/ trace quantity burned material	Loose	Blk	SAND - SOME SILT - TR GRAVEL - TR BURNED MAT. (f-m sand, tr. c. sand, poorly graded, f. gravel to 1/2", charcoal clinkers (2-3 pieces) to 1/4" size mixed in sand matrix	SM	Fill - Trace % burned material mixed w/ sand				
			2.5/4'										
S1													
	2												
				Clayey SILT	Dense/ Stiff	Brn-Red	SILT - SOME CLAY sized particles	ML	Damp to wet (fines); Native?	Fill(?)			
	2.5												
				?	?	?	?	?	Partial recovery - compressed loose fill soils (?)				
	4												
			0.3'/4'	Clayey SILT	Soft	Brn	SILT - SOME CLAY - (Similar to material in 2-2.5' interval)	ML	Very poor recovery - sudden drop in tools - possible void space encountered - likely fill	Saturated			
S-2	8												
			2'/2'		Soft	Brn	SILT - SOME CLAY - SOME SAND (Similar to material 4-8' w/ more f. sand, poorly graded @ EOB)	ML	Saturated - Refusal @ 10'				
S-3													
	10			w/ more sand									
				EOB @ 10'									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed mixed w/ sand matrix @ ~ 1.6-2' from top of liner. Trace % of charcoal clinkers viewed. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Possible void encountered 4-8'. Clayey silt unit may represent fill (?) - given void space.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-115
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole	Driller BZ
	0	N/A			Asphalt surface								
				Asphalt + Roadbase	Loose	Gray	ASPHALT & ROADBASE	Fill	Fill; damp				
	0.5						(C. subangular gravel to 1")						
				SAND	Loose	Brn-Orange	SAND (f-med, poorly graded tr. coarse sand)	SP					
	0.7												
				Burned Material mixed w/soil	Loose	Blk	SAND-SOME SILT-SOME	SM	Burned material				
							GRAVEL- BURNED MAT.		mixed w/ soil				
							(f-c sand, well graded, f-c gravel to 1",		Fill; damp				
S-1			2.3'/4'				furnace slag (red, hard nodules to 1/8" diameter)						
							and less than 5 pieces						
	1.7						of charcoal clinkers to 1/2")						
				Silty Sand	Loose	Brn	SILTY SAND - TR CLAY	SM	Fill; damp				
							(f-med sand, poorly graded, clay-sized						
	2.3						particles)						
				?	?	?	?	?	Partial recovery - loose soils				
	4												
				Clayey SILT	Stiff	Brn	SILT- SOME CLAY	ML	Mottled @ location (Red-Brn) w/ oxidized stringers				
S-2	5.5		1.5'/4'				(sized particles)		Damp soil @				
				?	?	?	?	?	~4' + drier @				
	8								~5.5'				
				Clayey SILT	V. Stiff	Brn	SILT - SOME CLAY	ML	Damp				
	10.3		3.3'/4'				sized particles						
S-3	10.8				M. Stiff		- similar to above w/ more f. sand		Saturated				
	11.3			Broken rock	Loose	Dk Gray	BROKEN ROCK - quartzite chips	Rock	Partial recovery - rock chips too base to capture.				
	12			EOB			Refusal - EOB @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed mixed w/ fill soils @ 0.7'-1.7' from top of S-1 liner. No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig

BORING No.: 34-116
DATE: 4-23-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drilling BZ
	0	N/A					Asphalt on top						
				Asphalt + Roadbase	Loose	Gray	ASPHALT, CONCRETE, ROADBASE	Fill	Fill; dry				
	1												
				Sand-Silt-Gravel-Mix		Brn	SAND-SOME GRAVEL	SW	Fill; damp				
							(f-c sand, well graded, f+c						
	1.7						subang. gravel to 1", rock fragments)						
						Blk	SAND - TR GRAVEL	SP	No obvious burned				
							(f-med sand, tr. coarse sand, poorly graded,		material but color				
							coarse subang. gravel		of material is				
	2.2		3.2'/4'				to 3/4")		suspicious				
S1					Dense	Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
							(f-med sand, poorly graded						
	2.5						brick pieces, to c. gravel subangular to 3/4")						
				Burned Material	Loose	Blk + Gray	BURNED MATERIAL	Fill	Fill; Burned				
							(primarily ash + charcoal clinkers -		Mat.; ash is				
	2.7						distinct layer)		off white in color				
				Sand-Silt	Dense	Brn	SAND - SOME SILT	SM	Fill; saturated				
	3						(f-med sand, poorly graded)						
				Clayey SILT	Soft	Brn	SILT - SOME Clay	ML	Native?;				
	3.2						sized particles		saturated				
					?	?	?	?	Partial recovery				
				?									
	4												
	4.4			Peat		Dk Brown	PEAT - fibrous mat	Pt	Native?				
S2			1.4'/4'	Clayey SILT	Soft	Brn	SILT - SOME clay	ML	Organic odor				
	4.7						sized particles		Native?				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 2.5'-2.7' from top of S1 liner (primarily ash + charcoal clinkers). No cultural artifacts observed. Possible native material @ 4'.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-116
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill. BZ
	4.7	N/A											
				Clayey SILT	Soft	Mottled Green-Gray to Brn	SILT - SOME CLAY sized particles - TR GRAVEL (similar to above, w/coarse subang. gravel to 2" in clayey silt)	ML	Stringers less than 2mm thick of dk gray colored material (Clay?) in soil; saturated				
S-2			1.4'/4										
	S4												
				?	?	?	?	?	Partial recovery - comprised soft soil (?)				
	8												
				Clayey silt	Soft	Green-Gray Brn	SILT - SOME CLAY sized particles - similar to material @ 4.4'-4.7'	ML	Native?; saturated oxidized laminae				
	9.6												
							SAND - TR SILT - TR GRAVEL (f-med sand, poorly graded, f. gravel, sub-ang. to 1/2", gold specs (pyrite (?)) - similar to above	SP					
S3			3.4'/4'										
	10.4												
	11.1												
				Sand & Gravel	Loose	Red-orange Brn	SAND & GRAVEL (f-med sand, tr. coarse sand, poorly graded, f. subang. gravel to 1/2")	SP	oxidized sand				
								SP	(brightly colored)				
	11.4												
				?	?	?	?	?	Partial recovery - soft soil / loose soil / wet soil - forces not strong enough to hold contents in liner				
	12												
							EOB @ 12' - refusal						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 2.5-2.7' from top of S-1 liner. Primarily ash + charcoal clinkers observed. No cultural artifacts observed. Possible native material @ 4'

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig

BORING No.: 34-117
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample**	Sample BZ	Borehole**	Driller BZ
	0	N/A					Asphalt surface						
				Asphalt + Roadbase	Loose	Gray	ASPHALT + ROADBASE	Fill	Fill; dry				
	0.8						(coarse gravel pieces)						
				Sand			SAND-(f-med sand	SP	Fill; damp				
	1.3						poorly graded)						
				Burned Mat.	Loose	Blk	BURNED MATERIAL	Fill	Fill; dry				
			2.9' / 4'				(major components- charcoal						
S-1							clinkers, furnace slag, red nodules scattered/						
							mixed w/ f-c sand-size						
	2.1						particles						
				Silt-Sand-Grav.	Denser	Brn	SILTY SAND-SOME GRAV.	SM	Fill; wet				
							(f-med sand, poorly		Increased silt				
							graded, f+c arg.		@ bottom 0.2'				
	2.9						gravel to 1")		of liner sample				
				?	?	?	?	?	Partial recovery-				
	4								Loose fill soils- compressed (?)				
				Clayey SILT, f. sand, organic material	Soft	Brn-Gray	SILT & CLAY sized	ML	Native? Fill?	wet;			
							particles - TR ORGANICS		Oxidized stringers				
	4.7						(pieces of wood)		(possibly f. sand?)				
S-2			1.8' / 2'		Stiff		SILT & CLAY sized	ML	Damp only				
							particles- similar						
							to above w/ mottled						
							coloration and more						
	5.8						fine sand than above						
				?	?	?	?		Partial recovery				
	6						Refusal @ 6'-EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 1.3'-2.1' from top of S-1 liner. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig)

BORING No.: 34 - 118
DATE: 4-26-04
GEOLOGIST: K. Jalbut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill BZ
	0	N/A			Asphalt surface								
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							(f-c sand, well graded,						
	0.3						f. ang. gravel to ½")						
				Gravel w/silt + sand	Denser	Brn	GRAVEL - SOME SILT - SOME SAND	GM	Fill; damp				
							(f-c sand, well graded,						
	0.6						f. angular gravel to ½", fines, brick pieces)						
			1.6'		Dense	Dk brn	- similar to above		Fill; damp				
S1	0.9		4'										
				Gravel only	Loose	Gray-Blk	GRAVEL	GP	Fill; damp				
							(coarse subang. gravel						
	1						to 1")						
				Burned material	Loose	Blk	BURN MATERIAL -	Fill	Fill; damp				
							(major components - off-white to tan colored						
	1.1						ash + charcoal clinkers)						
				Gravel only	Loose	Gray-Blk	GRAVEL	GP	Fill; damp				
							(coarse subang. gravel to						
	1.6			B4-			1")						
				?	?	?	?	?	Partial recovery -				
									Loose fill soils/gravels etc.				
	4												
				EOB @ 4'			Refusal @ 4' EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material (ash + clinkers) btwn gravels - observed 1-1.1' from top of S-1 liner (small interval). No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig

BORING No.: 34-120
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification (Ground Surface)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Drillers BZ
	0	N/A											
				Silt-Sand-Gravel Mix	Loose	Brn	SILTY SAND-SOME GRAVEL (f-med sand mostly, tr. coarse sand, poorly graded, f to crs-sub ang. gravel to 1", brick pieces)	SM	Fill; damp				
	0.8												
S-1			1.6'/4'	Burned Mat.	Loose	Blk	BURNED MATERIAL- (major components- charcoal clinkers + furnace slag)	Fill	Burned material Fill; damp				
	1.1												
				Silt-Sand-Grav. Mix	Loose	Brn	SILTY SAND-SOME GRAVEL - similar to above	SM					
	1.6												
				?	?	?	?	?	Partial recovery- loose fill soils (?)				
	4												
				Burned material	Loose	Blk	BURNED MATERIAL- (major components: charcoal clinkers, furnace slag, ash, red nodules 1/4-1/2")	Fill	Different components than above- not likely cave-in material				
	4.8												
				Sand	Loose	Dk brn	SAND - TR SILT (f. sand mostly, poorly graded)	SP	Fluffy/airy soil				
	5.1		2.5'/4'										
S-2				Silty Sand + Gravel	Denser	Red-Brn	SILTY SAND-SOME GRAVEL (f. sand, poorly graded, coarse ang-sub ang gravel to 1")		Fill; damp				
	6.1												
				Rock frags	Loose	Gray	BROKEN ROCK FRAGS. (f to c size quartzite pieces)						
	6.5												
				?	?	?	?	?	Partial recovery- compressed soils (?)				
	8			EOB@8'			Refusal @ 8'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed in 2 intervals - diff. components in each interval: 0.8-1.1' from top of S-1 liner; 4-4.8' (top of S-2 liner). No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig
BORING No.: 34-121
DATE: 4-25-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Cross-Section)	USCS *	Remarks	PID/FID Reading (ppm): Sample**	Sampler BZ**	Borehole**	Driller BZ**
	0	N/A											
				silt-sand-gravel	Loose	Dk brn	SILTY SAND - SOME GRAVEL	SM	Fill; damp				
							(f-med sand, poorly graded, f+c subang. gravel to 1")						
	0.3												
	0.6			rock	Loose	wht	BROKEN QUARTZ NODULE	Rock	Fill; burned				
				soil + burned material	Loose	Dk brn	SAND & GRAVEL - SOME	SM-GM	material mixed				
S-1			2'/4'			Blk	SILT - BURNED MATERIAL	Fill	in soil and				
							(f-c sand, well graded, f+c ang-subang gravel, brick pieces, scattered		then a distinct				
							mixed charcoal clinkers, in matrix to 1.9'; all		interval of only burned				
	2			burned mat. only			charcoal clinkers 1.9-2')		material observed				
				?	?	?	?	?	Partial recovery -				
	4								compressed soils (?)				
				Gravel-Sand	Loose	Brn	GRAVEL - SOME SAND - TR SILT	GW	Fill; dry				
			1.1'/9.5				(f-c sand, well graded, f+c ang-subang gravel to 2";						
S-2						Red-brn to Gray	quartzite pieces to 2")						
	S-1				?	?	?	?	Partial recovery -				
				?					loose soils tough to capture (?)				
By 4/25	7.5/8												
							Refusal @ 7.5' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 0.6-2' from top of S-1 liner. Material Mixed w/ soil, 0.6 to 1.9'; solid clinker layer 1.9-2'. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-123
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Edge of asphalt, gel fault, ground)	USCS *	Remarks	PID/FID Reading (ppm) Sample**	Sampler BZ	Borehole	Drillers BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk-Brn	ASPHALT & ROADBASE (f-c sand, well graded, silt, f+c subrnd-subang. gravel to 3/4")	Fill	Fill; dry				
	0.5												
			2.3' / 4'	Silt-Sand-less gravel	Dense/ Tight	Red-Brn	SILTY SAND - SOME GRAV. (f-med sand, tr. coarse sand, poorly graded, f+c subang + subrnd gravel to 1")	SM	Fill - damp; wet @ ~1.5' (fines)				
S-1	1.9												
	2.3			Sand+ Grav	Loose	Tan-Brn	SAND & GRAVEL - SOME SILT (f-m sand, poorly graded, f+c subang gravel to 1.5")	SM-GM	Fill; dry				
	4			?	?	?	?	?	Partial recovery - compressed soil or frictional forces not strong enough to hold material in liner.				
	4.5			Sand-Gravel Mix	Loose	Tan-Brn	SAND - SOME GRAVEL (f-m sand, tr. c. sand, poorly graded, fine subang gravel to 1/2")	SP	oxidized material (less gravel than above) Fill; dry				
S2	5.3		2'/2.5'	Gravel fill	Loose	Bright Red-Orange	GRAVEL - oxidized, weathered surfaces to fine angular to subang. gravel to 1/2"		Fill; wet; BRIGHT COLORATION				
	6			Silt-Sand-Gravel Mix	Denser	Orange-Brn	SILTY SAND - SOME GRAV. (f-m sand, poorly graded, course subang-subrnd gravel to 1.5")	SM	LESS BRIGHTLY COLORED THAN ABOVE. (FILL)				
	6.5			? EOB			? Refusal @ 6.5' - EOB		Partial recovery				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No burned material observed. No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig

BORING No.: 34-124
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification (Grain size)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Drillr BZ
	0	N/A											
				Grav-Fill	Loose	Gray	GRAVEL FILL - coarse	GP					
	0.6				↓	↓	subang gravel to 2", grass roots	↓					
				Grav + Sand	Loose	Red-Brn	GRAVEL - SOME SAND - TR SILT	GP					
							(f-c sand, well graded, coarse subangular						
	0.7		2'/		↓	↓	gravels to 2")	↓					
S-1	0		/4'	Burned Material	Loose	Blk	BURNED MATERIAL -	Fill	Distinct layer;				
	0.95				↓	↓	(Charcoal clinkers only)	↓	fill; dry				
				Gravel-Sand-More silt	Loose	Red-Brn	GRAVEL - SOME SAND - TR SILT	GP					
	1.5				↓	↓	(Similar to above)						
					Denser	Tan-Brn	- color change +		Fill; damp				
	2				↓	↓	increased amt. of silt	↓					
				?	?	?	?	?	Partial recovery -				
↓	4		↓		↓	↓	↓	↓	compressed loose fill soils (?)				
				Sand + Gravel	Loose	Red-Brn	SAND & GRAVEL	SP-GP	Fill; dry				
							(f-m sand, tr. c. sand,						
							poorly graded, f-c subang.						
	5.2				↓	↓	gravel to 1", brick pieces)						
S-2			2.1'/	Clayey Silt	Med. Stiff	Tan-Brn	SILT & CLAY sized	ML	Native (?); wet				
	5.8		3'		↓	↓	particles	↓	(fines)				
				Sand + Gravel	Loose	Brn	SAND & GRAVEL	SW-GW	Dry; Fill (?)				
							(f-c sand, well graded,						
	6.1				↓	↓	f-c subang gravel to 1")	↓					
				?	?	?	?	?	Partial recovery				
↓	7		↓		↓	↓	↓ EOB @ 7' - refusal	↓	↓				
				EOB @ 7'									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 0.7-0.95' from top of S-1 liner - Clinkers only. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

124-125 M/D

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - (~~Btwn R4 + 125~~) JRA
DATE: 4-25-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/Consistency or Rock Hardness	Color	Material Classification (Soil: Name, Moisture, Grain Size, Plasticity; Rock: Lithology, Grain Size, Texture)	USCS *	Remarks	PID/FID Reading (ppm) Background	Sample Interval	Borehole	Collar
	0	N/A											
				Asphalt + Roadbase	Loose	Blk-brn	ASPHALT & ROADBASE	SW-GW	Fill; dry				
							(f-c sand, well graded,	Fill					
	0.5						f+c ang. gravel to 1", organic roots)						
				Sand + Gravel	Loose	Brn	SAND AND GRAVEL	SW-GW	Fill; possibly more				
							(f-c sand, well graded, f+c		roadbase material;				
	1.1						ang. + subang gravel to 1.5")		damp				
				Clayey Silt, f. sand	Dense	Red-brn	SILT - SOME CLAY SIZED PARTICLES - TR SAND - TR GRAVEL	ML	Fill; damp				
S-1			2.4'/4'				(Mostly silt/clay; f.						
							sand, poorly graded, coarse subang gravel to						
	1.7						1.5")						
				Sand + Gravel	Loose	Brn	SAND AND GRAVEL - TR SILT	SW-GW	Fill; dry				
							(f-c sand, well graded,						
							f+c ang-subang. gravel to						
	2.4						2")						
				?	?	?	?	?	Partial recovery -				
	4								Loose fill soils - (compressed (?))				
				Sand + Gravel			SAND AND GRAVEL - TR SILT	SW-GW	Fill; dry				
S-2			0.5'/0.5'				- similar to above						
	4.5												
				EOB @ 4.5'			Refusal @ 4.5' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No burned material observed. No cultural artifacts observed

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-125
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Grain size, etc.)	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Grav.-Silt-Sand	Loose	Red-Brn	GRAVEL-SOME SAND-SOME SILT	GM	Fill; damp				
	1				↓	↓	(Mostly c. angular grav. to f-c sand, well graded, silt + clay sized particles)						
			2.4	Less gravel-more fines	Med. Stiff / Med Dense	Red-Brn	SILTY SAND-SOME GRAVEL (f. sand, poorly graded, f. subang gravel to 1/2")	SM	Fill; fines wet (less gravel than above)				
S-1	1.7		4'		↓	↓							
					V. Stiff	Tan Brn	- increased stiffness or density (possibly clay-sized particles)		Fill; dry				
	2.4				↓	↓	↓	↓	↓				
				?	?	?	?	?	Partial recovery				
	4				↓	↓	↓	↓	↓				
				Silt-Sand-More gravel	Loose	Tan Brn	SILTY SAND AND ~~SOME GRAV~~	SM-GM	Fill; dry				
S-2			1'/1'		↓	↓	- similar to above w/ more coarse ang. gravel + quartzite chunks	↓	↓				
	5				↓	↓	↓	↓	↓				
				EOB @ 5'			refusal on rock (?) @ 5' - boulder (?)						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: No buried material observed. No cultural artifacts observed.

Drilling Area Background (ppm):

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-126
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole**	Drill BZ
	0	N/A					Asphalt Surface						
				Asphalt	Loose	Blk	ASPHALT CHUNKS	Fill	Fill				
	0.6				↓	↓	↓						
				Sand + Burned Material	Loose	Brn	SAND - SOME SILT - SOME GRAVEL	SP-SM	- Trace % burned material				
							Mostly f-med sand, tr.		mixed in interval				
			1.6'/4'				c. sand, poorly graded, fine + coarse subang.		- some sand +				
							gravel to 1", trace		gravel exhibit				
S-1	1.2				↓	↓	amt. of charcoal clinkers mixed in soil	↓	iron stains (oxidized intervals)				
				Gravel + Burned Material	Loose	Blk	GRAVEL AND BURNED MAT.	(FP)	Fill; More burned				
							(Charcoal clinkers mixed		material; dry				
	1.4				↓	↓	w/ coarse ang. gravel fill)	↓	↓				
				Silty Sand	Denser	Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
							(Mostly f. sand, poorly						
	1.6				↓	↓	graded, fine subang. gravel to 1/2")	↓					
				?	?	?	?	?	Partial recovery - compressed soil				
	4				↓	↓	↓	↓	or frictional forces not strong enough to hold material in liner				
				Silty Sand + Burned Mat.	Loose	Blk-Brn	BURNED MATERIAL -	SM	(Likely cave-in				
			0.5'/0.5'				Mixed w/ silty f-m		material from				
S-2							sand, tr. c. subang		upper interval)				
	4.5						gravel to 1")						
				EOB @ 4.5			Refusal @ 4.5'-EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Observed burned material 0.6-1.2' and 1.2'-1.4' from top of S-1 lines. Burn material in S-2 lines likely cave-in material from the upper interval.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig

BORING No.: 34 - 127
DATE: 4-25-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Size of asphalt, grain size)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt	Loose	Brn-Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							f-c sand, well graded, coarse ang.-subang. gravel to 2", org. roots, asphalt						
	0.4			Roadbase Mat.	Loose	Red Brn	GRAVEL - SOME SAND - TR SILT	GW	More roadbase fill (?); damp				
							(f-c sand, well graded, ang.						
	1						f-c gravels to 1.25")						
	~~1.2~~			More roadbase ?	Loose	DK Gray	GRAVEL - TR f-c, wg sand	GW	More roadbase (?)				
	1.2						w/ f-c gravels)						
				Gravel + Burned Mat.	Loose	Blk	GRAVEL - SOME SAND - SOME	GP/ Fill	Burned material				
S1			2.2'/4'				BURNED MATERIAL		mixed w/ gravel + sand (Fill)				
							(f-c sand, well graded, coarse ang. gravel to 3/4", small pieces charcoal		Damp				
	1.5						clinkers, 1/2" red nodules, sm. pieces furnace slag						
				Silty Sand	Denser	Red Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
	1.7						(f-med sand, poorly graded, fine ang. gravel to 1/2")						
				Sand + Burned Material	Loose	Brn	LOAM / SAND - TR	SP/ Fill	Airy-light material				
							BURNED MATERIAL		Clinkers (burned				
							(f-med sand, poorly graded, loam-like, w/ scattered/mixed charcoal clinkers to		material) mixed w/ loamy sand				
	1.9						1/2"						
				Silty Sand	Denser	Red-Brn	SILTY SAND - TR GRAVEL	SM	Fill; dry				
							(f-med sand, poorly graded, f. ang. gravel to 1/2")						
				Gravel	Loose	Gray	GRAVEL / ROCK FRAGS	Rock-GP	Fill;				
	2.2						(Quartzite chunks (coarse))						
				?	?	?	?	?	?				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed mixed w/ gravel + sand btwn 1.2 + 1.5' from top of S-1 liner, and from 1.7'-1.9' in same liner - scattered clinkers visible. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance Ldo DT tracked rig
BORING No.: 34-127
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Zone	Borehole	Drill Hole
	2.2	N/A											
↓			↓	?	?	?	?	?	Partial recovery -				
↓	4		↓		↓	↓	↓	↓	too gravelly/rocky to capture				
↑			↑	Silty Sand	Loose	Dk Red-Brn	SILTY SAND - SOME GRAVEL		Fill; damp				
					↓	↓	(f-m sand, poorly graded,		↓ ↓				
	5		1.5'		↓	↓	f-c ang-subang gravel to 1.5")						
5.2			1.5'	More Gravel; Silt (trace)	Denser	brn	GRAVEL - TR SILTY SAND	GP	Fill; damp				
↓			↓		↓	↓	(Mostly coarse ang-subang gravel to 1.5"; silt, f. sand (minor)	↓	↓ ↓				
↓	5.5		↓		↓	↓	root chunk @ bottom	↓	↓ ↓				
				↓			refusal on root chunk @ 5.5'						
				EOB @ 5.5'									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: See remarks on p. 1 of 2

Drilling Area Background (ppm):

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig

BORING No.: 34 - (~~from 127 + 129~~) 127-129 MID
DATE: 4-25-04
GEOLOGIST: K Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft) or Screened Interval	MATERIAL DESCRIPTION: Soil Consistency / Rock Hardness	Color	Material Classification (USCS, Soil, Rock)	USCS *	Remarks	PID/FID Reading (ppm): Soil Core	Sample Bag	Borehole	Drill Rig
	0	N/A											
				SAND + GRAVEL	Loose	Brn	SAND AND GRAVEL - SOME SILT	SM/GM	Fill; damp				
					↓	↓	(f-c sand, well graded f+c ang. to subang.						
	0.5						gravels to 1.5"; organic roots)						
				BURN. MAT.	Loose	Blk	BURNED MATERIAL -		Thin layer of				
	0.6		2.1'		↓	↓	(charcoal clinkers, white ash, trace ferrous slag)		burned material (fill; dry)				
			4'	SAND + GRAV.	Loose	Brn	SAND AND GRAVEL - SOME SILT	SM/GM	Fill; damp				
	1.6				↓	↓	↓ - similar to 0-0.5'		↓ ↓				
				SILT-SAND-GRAVEL MIXED W/BURN. MAT.	Denser	Brn-Blk	SILTY SAND - SOME	SM					
8'							GRAVEL - SOME BURNED MAT.		Burned material mixed w/soil,				
							(f-med sand, poorly graded		Fill; damp				
							f+c ang-subang gravel to 1", brick pieces,						
	2.1				↓	↓	charcoal clinkers, ash, non-charred wood)		↓				
				?	?	?	?	?	Partial recovery				
	4				↓	↓	↓	↓	compressed fill soils (?)				
				Silt-Sand-Gravel Mix	Dense	Brn	SILTY SAND - SOME GRAVEL	SM	Fill; damp				
							(f-med sand, tr. c. sand, poorly graded,						
5.2			1'/3'				f+c ang-subang gravel						
	4.5				↓	↓	to 1.25")	↓					
						Brn-Brn	- similar to above w/only coarse gravel		↓ ↓				
	5.0				↓	↓	↓	↓					
				?	?	?	?	?	Partial recovery -				
	7				↓	↓	↓	↓	compressed soil (?)				
				EOB @ 7'			Refusal @ 7' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: Burned material observed 0.5-0.6' from top of S-1 lines (distinct layer); mixed w/soil from 1.6-2.1' from top of S-1 lines. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance Cobra DT tracked rig

BORING No.: 34 - 128
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification: Asphalt Surface	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							(f-c sand, well graded, f+						
							c. gravel, subang. to 1";						
	0.5						trace silt)						
				Burned Mat. mixed w/soil	Loose	Blk-Brn	SILTY SAND - SOME	SM	Burn mat. mixed				
							BURNED MAT.	Fill	w/soil				
							(f-med sand, poorly graded,						
	0.9						mixed w/charcoal clinkers,						
							furnace slag, ash)						
				Silt-Sand-Gravel Mix	Dense Red	Dk Brn	SILTY SAND - SOME GRAVEL	SM/GM	Root @ 1.4-1.6'				
S-1			2.5'/4'				(f-med sand, tr. c. sand,						
							poorly graded, f+c ang.						
	1.8						to subang. gravel to 3/4")						
				Burned Mat. mixed w/soil	Loose	Blk	SAND - SOME BURNED	SP	Burned mat.				
							MAT. - TR SILT - TR GRAV.	Fill	mixed w/soil				
							(f-med sand, poorly graded,						
							coarse subang + subrnd						
							gravel to 3/4", mixed						
	2.2						w/ charcoal clinkers +						
							ash)						
				Silty Sand	Loose	Red-Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
							(f-med sand, poorly graded,						
	2.5						f+c gravel to 3/4")						
				?	?	?	?	?	Partial recovery				
	4								compressed soil (?)				
				Silty Sand	Loose	Tan-Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
S-2	4.6		1.1'/2.5'		Loose		(f-med sand, p. graded, f.						
				Gravel		Red	subang gravel to 1/2")						
							GRAVEL - SOME SAND - BROKEN ROCK						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material mixed w/ soils observed in 2 intervals: 0.5-0.9' and 1.8-2.2' from top of S-1 liner. No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 128
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Driller BZ**
	4.6	N/A											
			1.4' / 2.5'	Gravel	loose	Red	(f-c sand, well graded, f-c ang-subang gravel to 1.5", oxidized surfaces to gravels, oxidized sand grains; rock chips	GW-SW	Fill; damp				
	5.1												
				?	?	?	?	?	Partial recovery - (compacted soil)				
	6.15						refusal @ 6.15' EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: See remarks p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 129
DATE: 4-25-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (+ Lithologic, Moist, Groundwater)	USCS *	Remarks	PID/FID Reading (ppm): Fill Sample**	Sampler BZ	Borehole**	Driller BZ**
	0	N/A											
	0.5			Asphalt	Loose	BLK	ASPHALT, ORG. ROOTS, GRASS	Fill	Fill				
				Road base (?)	↓	↓	GRAVEL - SOME SAND	GW	Fill; damp				
					Loose	Red-Brn	(f-c sand, well graded, f to c ang. gravel to 1",		Roadbase (?)				
	1.6				↓	↓	rock chips)	↓					
				Gravel Fill	Loose	Dk Brn	- similar to above	GW	Fill; damp				
	2.1				↓	↓	slightly dk. coloration	↓					
S-1			2.7' / 4'	Burned Mat.	Loose	BLK	- BURNED MATERIAL -	Fill	Distinct layer -				
							(major components: charcoal clinkers, furnace		not mixed w/ soil				
	2.3			↓	↓	↓	slag; less ash (minor component))	↓					
				Silty Sand	Loose	Dk Brn	SILTY SAND - TR GRAVEL	SM	Fill; damp				
							(f-med sand, tr. coarse sand, poorly graded,						
	2.7				↓	↓	fine ang. gravel to 1/2")	↓	↓ ↓				
				?	?	?	?	?	Partial recovery compressed fill soils (?)				
	4				↓	↓	↓	↓					
				Burned Mat. mixed w/soil (?)	Loose	Red-BLK-Brn	BURNED MATERIAL -	Fill	Burned material				
							LOAM/SAND - TR SILT	SP	Mixed w/ soil				
							(f-med sand/loam - poorly graded, brick pieces		(possibly cave-in material)				
	4.3				↓	↓	mixed w/charcoal clinkers)		↓				
S-2				Loamy Soil, wood	Loose	Dk Brn	LOAM/SAND - TR SILT -	SP					
19/4/05 Ae			2.2' / 3'				TR ORGANIC MAT		Loam-like material				
							(f-med sand, poorly graded,		is airy - lightweight				
	4.8			↓	↓	↓	non-charred wood chunks)	↓	↓				
				Clayey SILT, f. sand	Soft	Red Brn	SILT - SOME CLAY sized	ML	Fill; damp -				
							particles - SOME GRAVEL -		wet (fines)				
					↓	↓	TR SAND	↓	↓				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: Burned material observed 2.1-2.3' from top of S-1 liner
Second burned interval from 4-4.3' of S-2' liner is likely cave-in material
No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-129
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample 6"	Sample BZ	Bore 6"	Bore BZ
	4.8	N/A											
				Clayey SILT, f. sand	Soft	Red-Brn	(Mostly silt-clay sized particles, some arg. gravel to 1", tr. fine, poorly graded sand)	ML	Fill; damp-wet (fines) Mottled coloration				
	5.5		2.2'/3'										
				Silty sand, clay-sized too	Stiff/ Med Dense	Tan Brn	SILTY SAND - TR CLAY (f-med sand, poorly graded; trace clay-sized particles)	SM	Fill; dry				
	6.2												
				?	?	?	?	?	Partial recovery compressed soil (?)				
	7						Refusal @ 7' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: See remarks p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-130
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole **	Drillers BZ
	0	N/A											
				Mostly Gravel, Silt + Sand	Loose	Dk Brn	GRAVEL - SOME SILT - SOME SAND	GM	Fill; damp				
							(Mostly f-c subang + subrnd gravel to 1.5", f-c sand, well graded)						
	0.75												
				Burned Material @ bottom	Loose	Blk + Gray	BURNED MATERIAL - (ash and less than 5 pieces of charcoal clinkers)	Fill	Burned mat. @ bottom of interval; glassy surface to clinkers				
	0.9												
			1.8'/4'	Gravel	Loose	Dk Gray	GRAVEL - f. ang, poorly graded gravel to 1/2"	GP	Fill; dry				
S-1	1.3												
				Gravel Silt Sand, Fill	Denser	Brn-Red Brn	GRAVEL - SOME SILT - SOME SAND (Similar to 1st interval above; brick, glass shards too)	GM	Fill; damp				
	1.5												
				Burned Mat @ bottom	Loose	Blk - Gray	BURNED MATERIAL - (major components - ash, charcoal clinkers, furnace slag)	Fill	Burned mat. @ bottom of interval				
	1.8												
				?	?	?	?	?	Partial recovery - Compressed soil				
	4												
				Clayey SILT	Dense/ Stiff	Gray Brn	SILT - SOME CLAY sized particles - TR f. SAND		oxidized; iron stains - fill; mottled coloration to silt				
S-2			1.1'/4'										
	5.1												
				?	?	?	?	?	Partial recovery -				
	8												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Observed 2 intervals of burned material - each distinct layers (not mixed w/ soil) @ the bottom of another interval: 0.75'-0.9' AND 1.5-1.8' from top of S-1 liner. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Note: Area of recent construction (new manway to outfall 50 and new drainage line). Burned material previously detected in area (general) + removed - replaced w/ new fill soils.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig
BORING No.: 34-130
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole**	Driller BZ
	8	N/A											
				Silty Sand	Dense	Red-Brn	SILTY SAND - TR GRAV.	SM	Fill; damp				
							TR CLAY						
5-3			1.5'/2'				(f-med sand, poorly graded,						
	9.5						coarse, subang gravel to 1", clay-sized particles						
					?	?	?	?	Partial recovery				
				?									
	10												
							Refusal @ 10' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: See remarks p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS- Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-131 (Hand auger)
DATE: 4-27-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	Est. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A	N/A										
↑				Silty Sand	Loose	Dk Brn	SILTY SAND-SOME ORGANICS	SM	Topsoil; damp				
S-1					↓	↓	(Mostly f-med sand, poorly graded,	↓	-No visible burned				
↓	0.3						silt, organic roots)		material				
↑				Gravel Cobble Sand-Silt Mixture	Loose	Tan Brn	GRAVEL- SOME COBBLES-	↓	Fill; wet				
							SOME SAND-SOME SILT-						
							SOME BURNED MATERIAL	GM	Burned material				
S-2							(f-c sand, well graded,		observed @				
							f. subrnd gravel to ½",		bottom of hole				
							c. subang+subrnd gravel,		(~1.3-~1.4')				
				↓			to 1", cobbles to 2", sub						
				Burned Mat. @ bottom			rnd, 2-3 pieces of						
↓	1.4				↓	↓	charcoal clinkers)	↓					
							EOB @ ~1.4'						
							Notes- excavation required use of hand tools- drill location too close to edge of embankment to use DPT rig. Drill location in thorn bush- hole angled back towards the Channel. Soil moisture due to heavy rain previous day + night.						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Burned material observed in bottom of hole @ ~1.3-1.4' from ground surface - encountered charcoal clinkers. No cultural artifacts observed

Drilling Area Background (ppm):

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS- Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-132 (hand auger)
DATE: 4-27-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A	N/A				Ground Surface						
				Silty Sand - Topsoil, organics	Loose	DK Brn	SAND - SOME SILT - SOME ORGANICS - TR GRAVEL (Mostly f-med sand, poorly graded, f. subrnd gravel to 1/2", organic roots, grass, tree roots)	SM	Topsoil; wet - No burned material observed - Root mat (0-0.2')				
S-1	0.4												
				Sand, Grav, Cobble Mix	Loose	Tan-Brn	SAND AND GRAVEL - SOME COBBLES - TR SILT (f-c sand, well graded, fine subrnd gravel to 1/2", coarse subrnd + subang gravel to 1", subrnd cobbles to 3", glass shards)	SW-GW	- Fill; wet - No burned material observed				
S-2	1												
				Gravel-Silt-Sand-Cobble Mix			GRAVEL - SOME SILT - SOME SAND	GM					
					Loose	DK Brn	SOME COBBLES (Mostly f. subrnd gravel to 1/2", coarse gravel to 1", subrnd cobbles to 3", well graded f-c sand, silt)		- Fill; wet - No burned material observed - More silt than above				
S-3	2												
							GRAVEL - SOME SILT, SAND,	GM					
				Soil mixed w/ burned material	Loose	BK	BURNED MATERIAL, TR CLAY, COBBLES (f. subrnd gravel to 1/2", coarse subrnd + subang gravel to 1.5", 1 subrnd cobble to 3", f-c sand, well graded, silt + clay sized particles, charcoal clinkers 1-2" length)		- Burned material mixed w/ soil (no distinct layer of clinkers) - Fill; saturated - less sand than above				
S-4	3												
				No burned mat - similar soil	Loose	DK Brn	GRAVEL - SOME COBBLES SOME SILT - SOME SAND - similar to above except no burned material + more cobbles (refusal @ 3.8')	GM	- Fill; saturated - No burned mat. observed - More cobbles than above				
S-5	3.8			EOB - refusal									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Burned material observed approx. 2-3' bgs (charcoal clinkers mixed with soil). No cultural artifacts observed

Drilling Area Background (ppm): [ ]

Converted to Well: Yes ____ No X Well I.D. #: ____

Note: Excavated w/ hand tools. Location too close to edge of slope for DPT rig - too close to utilities.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS- Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-133 (hand auger)
DATE: 4-27-04
GEOLOGIST: K. Jalkut
DRILLER: S. Anderson (TENUS PIT)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A	N/A				Ground Surface						
S-1	0.3			Silty Sand - Topsoil	Loose	DK Brn	SILTY SAND - SOME ORGANICS (f-med sand, poorly graded, grass, tree roots)	SM	Topsoil; wet - No burned material observed				
S-2	0.6			Sand-Grav Mix	Loose	Brn-DK Brn	SAND - SOME GRAVEL - TR SILT (f-c sand, well graded, f-c subrnd gravel to 1")	SW-SW	- Fill; wet No burned material observed				
S-3	2			Grav-Sand-Silt Mix w/o burn. mat.	Loose	Brn	GRAVEL - SOME SAND - SOME SILT - TR CLAY - TR COBBLES (f-c sand, well graded, f-c subang + subrnd gravel to 1.5", 3" subrnd cobbles, clay sized particles)	GM	- Uniform material - No burn. mat. observed - GRAVEL ONLY				
S-4	2.3			Gravel layer	Loose	Gray	GRAVELS - f-c subang - subrnd gravel to 1.5"	GW	- Burned material @ or near bottom of hole - no distinct layer. Clinkers mixed w/soil				
S-5	2.8			Grav. Sand Silt Mix w/burn material @ bottom	Loose	Brn	GRAVEL - SOME SAND - SOME SILT - TR CLAY, COBBLES, BURNED MATERIAL - similar to 0.6'-2' interval w/ scattered charcoal clinkers @ bottom (~2.5-2.8')						
							Refusal @ ~2.8' - cobble (~4") - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed ~2.5-2.8' bgs - near bottom of hole - Clinkers mixed w/soil. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Note - Excavated w/ hand tools. Location too close to edge of slope for DPT rig - too close to utilities.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig

BORING No.: 34-134 (Pile w/burn. mat.)
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification + Remarks	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole	Driller BZ
	0	N/A											
	0.1			Root Mat	Loose	Brn	ROOT MAT / GRASS		Topsoil				
				Topsoil like material w/ burned material (mixed)	Loose	DK Brn	SAND - SOME SILT - SOME ORGANICS - SOME BURNED MATERIAL (f-c sand size particles, silt size particles, organic roots + twigs, charcoal clinkers + furnace slag)	SM / FILL	Fill; damp - Visible burned material in a soil-like matrix				
S1	0.3		1.5/4'				-BURNED MATERIAL-	FILL	Burned material not mixed w/soil (Distinct layers)				
	0.7			Burned Material (Distinct Layers)	Loose	BLK	- Charcoal clinkers, furnace slag, red nodules						
	0.8					OFF WHT	- ASH LENS - FLUFFY						
	0.9					BLK	- charcoal clinkers, furnace slag, red nodules						
	1.0					OFF WHT	- ASH LENS - FLUFFY						
	1.1					BLK	- charcoal clinkers, furnace slag, nodules						
	1.2					OFF WHT	- ASH LENS - FLUFFY						
	1.5					BLK	- charcoal, furn. slag, nodules, clinkers						
				?	?	?	?	?	Partial recovery - compressed materials (?)				
	4			Burned Material	Loose	BLK	BURNED MATERIAL -	FILL	Distinct layer of burn. mat. but ash is mixed w/ other components				
	4.2					off wht	- charcoal clinkers, furnace slag, ash (mixed)						
					Loose	gray off	- ASH, f. sub rng.			(4-4.2')			
	4.4					wht	gravel (gravel = cave-in material (?))						
S2	4.7		2.5/4'		Loose	BLK-red-BLK	- charcoal clinkers, furnace slag, ash (mixed)		- ash mixed w/ other components				
				Silty Gravel	Loose	Brn-Red Brn	GRAVEL - SOME SILT -	GM	-				
							TR SAND						
							(c. sub rnd gravel to 1.5")						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Location in pile w/ known burned material. Burned material observed: 0.1-0.3', 0.3-1.5', 4-4.7', + 5.5-5.7' approx. No cultural artifacts observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig
BORING No.: 34 - 134
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole **	Drill ** BZ **
		N/A	cont.										
				Silty Gravel	Loose	Brn-Red	f. sand, poorly graded,	GM	Fill; damp				
	4.9					Brn	fines)		No visible burned material 4.7-4.9'				
				Silty Sand-Gravel Mix	Loose	DK Brn	SILTY SAND-SOME GRAVEL	SM/GM					
							(f. sand, poorly graded,		- No visible burned				
							f+c subang gravel to 1")		material 4.9-5.2'				
	5.2						org roots (?) = cave-in material (?)		- Damp fill				
5.2	5.5		2.5'/4'	Clayey Silt	Soft	Green Brn	SILT & CLAY sized particles	ML	- wet (fines)				
				Burned Mat.	Loose	Blk	BURNED MATERIAL-	FILL	- Distinct layer				
	5.7						(Charcoal Clinkers Only)		- No soil				
				Clayey Silt			SILT & CLAY - TR SAND	ML					
					Soft	Green Brn	(fines w/ f. sand-poorly		- No visible burn. mat.				
	6.5						graded)		- Fill				
				?	?	?	?	?	Partial recovery compressed fill (?)				
	8												
							SILT & CLAY - TR SAND	ML	- Saturated (fines)				
					Soft	Orn-Brn	(Mostly fines w/ f sand-		- No visible burn. mat.				
	9.5						poorly graded)						
							SILTY SAND - SOME GRAVEL	SM-GM	No visible				
5.3			2.9'/3'				(f-med sand, tr. coarse sand, poorly graded,		burn material				
							f+c ang-subang gravel to		8-11'				
	10.7						1.5")						
							GRAVEL OR BROKEN ROCK						
	10.9												
	11						Refusal @ 11' - EOB						
				EOB @ 11									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: See p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-135
DATE: 4-26-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Grain Size, Moisture)	USCS *	Remarks	PID/FID Reading (ppm): Headspace	Sample Zone	Borehole	Drill Rig
	0	N/A											
				Topsoil-Fill Sand	Loose	Brn	SAND-SOME ORGANICS-TR GRAVEL (f-c sand, well graded, f+c subrnd gravel to 3/4") grass-roots	SW	Topsoil/root mat Saturated (heavy rain today) - No burned material visible				
	0.4			Silty Sand! Gravel	Loose	Gray-Brn	SILTY SAND-SOME GRAVEL (f-c sand, well graded, f+c subang & subrnd gravel to 1")	SM	- No burned material visible				
	1												
S-1			1.5/4'	Grav Sand Silt Mix	Loose	Dk Gray	GRAVEL-SOME SAND-SOME SILT (f-c sand, well graded, f. ang. gravel to 1/2", fines)	GM	- No burned mat. visible - Saturated (rain)				
	1.3			Burned Mat.	Loose	Blk	BURNED MATERIAL - (Major components mixture of charcoal clinkers, furnace slag, ash)	Fill	Fill; dry Visible burned material.				
	1.5			?	?	?	?	?	Partial recovery - compressed soil (?)				
	4			Burned Mat. (?)	Loose	Blk	BURNED MATERIAL - (Similar to 1.3-1.5' interval w/red nodules)	Fill	Q: Is this likely cave-in material?				
	4.4												
S-2			1.4'/4'	Silt, Sand, Grav. Mix	Loose	Dk Brn	SILTY SAND-SOME GRAVEL (f-c sand, well graded, fines f+c subang. gravel to 1.25")	SM/GM	Fill; wet (fines)				
	5												
				?	?	?	?	?	Partial recovery - Compressed fill soils (?)				
	8												
S-3	8.3		0.6/4'	Silt Sand Grav. Mix	Loose	Dk Brn	SILTY SAND-SOME GRAVEL (similar to 4.4-5' interval)	SM/GM	Fill; wet (fines)				
	8.6			SAND	Loose	Dk Red-Brn	SAND-coarse sand, poorly graded	SP	Fill; damp				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 1.3-1.5' from top of S-1 liners, no soil - all components. 2nd possible layer 4-4.4' (top of S-2 liners) BUT this is probable cave-in material. No cultural artifacts observed.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34 - 135
DATE: 4-26-04
GEOLOGIST: K Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drilling BZ
	8.6	N/A	cont.										
1			1		?	?	?	?	Partial recovery -				
S-3			0.6/4'	?	↓	↓	↓	↓	Loose coarse sand -				
↓	12		↓		↓	↓	↓	↓	Forces not strong enough to hold it inside liner				
↑			↑	SAND	Loose	Dk Red-Brn	SAND - similar to interval from 8.3-8.6'	SP	Fill; damp				
	12.3							↓					
			↑	Silty Sand Grav. Mix	Loose	Gray-Brn	SILTY SAND - SOME GRAVEL (f-c sand, well graded, Ac angular gravel to 1")	SM	Wet (fines)				
S-4			0.6'/1.5'		↓	↓		↓	Fill				
↓	12.6							↓	↓				
				?	?	?	?	?	Partial recovery -				
↓	13.5		↓		↓	↓	↓	↓	loose soils				
				EOB @ 13.5' refusal			Refusal @ 13.5'						
									Note: No visible burned material in the 8-13.5' interval.				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: See p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-136
DATE: 4-26-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Air Sample	Sample BZ	Borehole	Drillor BZ
	0	N/A											
				Sand-Topsoil	Loose	DK Brn	SAND-SOME ORGANICS-TR GRAVEL	SW	Topsoil; dry				
							(f-c sand, well graded, f. subrnd gravel to ¼", coarse subang. gravel to 3/4")		- No visible burned material				
	0.3						roots, grass						
				Silty Sand Mix	Loose	Gray Brn	SILTY SAND - SOME GRAVEL	SM	Fill; wet (fines)				
	0.9						(f-c sand, well graded, f-c subang & subrnd grav to 1.5")	"	- No burned material visible				
S-1				Gravel	Loose	DK Gray	GRAVEL & BROKEN ROCK	GP	Fill; dry				
	~1		~1.5/4'				(coarse gravel, quartzite frags)		- no burned material visible				
				Sand-Grav Mix	Loose	DK Brn	SAND-SOME GRAVEL	SP	Fill; damp				
							(f-med sand, poorly graded, coarse subang. gravel 3/4-1")		- No visible burned material				
	~1.4												
				Gravel	Loose	DK Gray	GRAVEL & BROKEN ROCK	GP	Fill; dry				
	~1.5						(coarse gravel + quartzite frags)		- No burned material visible				
				?	?	?	?	?	Partial recovery -				
	4				↓	↓	↓	↓	compressed loose soil/rock				
				Silt-Sand Grav Mix	Loose	Gray Brn	SILTY SAND AND GRAVEL	GM	- Fill; saturated				
							(f-c sand, well graded, f-c subang gravel to 1", fines)		(fines?)				
S-2	4.7		0.7/4'										
				?	?	?	?	?	Partial recovery -				
	8				↓	↓	↓	↓	Could not capture much soil				
				Grav-Sand Mix	Loose	DK Gray	GRAVEL - SOME SAND - TR SILT	GP	Fill; saturated				
S-3			0.5/2'				(f-c sand, well graded, coarse subang grav to 2", fines)						
	8.5				↓	↓	↓	↓	↓				
				?	?	?	?	?	Partial recovery - refusal @ 10'				
	10			EOB @ 10'	↓	↓	↓ refusal = 10'	↓	Loose soil?				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: No burned material observed. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-137
DATE: 4-24-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A					Grade Surface						
	0.2			ROOT MAT	Loose	Brn	ROOT MAT / GRASS	Fill	Topsoil				
	0.25					Gray	– BURNED MATERIAL- ASH	Fill	– ASH ONLY				
				Burned Material		BLK	– BURNED MAT: ASH, CHARCOAL CLINKERS, FURNACE SLAG		– MIXED LAYER OF BURN. MAT.				
	0.3												
	0.5					Gray	– BURNED MATERIAL: ASH		– ASH ONLY				
					Loose	BLK-Red Brn	– BURNED MATERIAL (charcoal clinkers, ash, furnace slag mixed w/ f-c sand size particles)		– MIXED LAYER OF BURN. MAT				
S-1			1.9'/4'										
	1.4												
				Silt-Sand Mix	Loose	Red Brn	SILTY SAND – TR GRAVEL (f. sand, poorly graded, f. gravel to 1/2")	SM	Fill soil; damp				
	1.7												
				Burned Mat.	Loose	DK Brn	BURNED MATERIAL: (ash and clinkers mixed	Fill	– Mixed layer of burned material				
	1.9												
				?	?	?	?	?	Partial recovery				
	4								loose soils, burned material-compressed (?)				
				Burned Mat. Mixed w/ soil	Soft	Gray-Brn	SILTY SAND – TR GRAVEL – SOME BURNED MATERIAL: (f-med sand, poorly graded, f. subang. gravel to 1/2", glass, charcoal clinkers, ash)	SM/Fill	– Burned material mixed w/ soil – Damp fill				
S-2													
	4.6		2'/4'										
				Clayey Silt	Soft	Brn	SILT – SOME CLAY – TR GRAVEL (Silt (mostly) w/ clay-sized particles, f. gravel, glass)	ML	Fill; damp				
	4.9												
					Soft	DK Brn	ORGANIC SOIL – PEAT (not very degraded)	Pt	Fibrous mat				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: 3 intervals of burned material observed: 0.2'-1.4'; 1.7'-1.9' (S-1); 4-4.6' (mixed w/ soil). No cultural artifacts observed

Converted to Well: Yes _____ No X Well I.D. #: _____

Note: Drill location on mound w/ known presence of burned material

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-137
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (ENV)	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler Bz	Sample Bz	Drill Bz
	4.4	N/A											
	5.3			Pt/wood	Soft	DK Brn	unchanged wood	Pt	- No visibly burned material				
				Silty Sand Mix	Loose	Green Brn	SILTY SAND - TR. GRAVEL (f. sand, poorly graded, fine subrnd gravel to ½")	SM	- Petroleum-like odor (?)				
	5.8		2½/4'										
S-2				Sand-Gravel Mix	Loose	Red Brn	SAND AND GRAVEL (f-med sand, poorly graded, f to subrnd gravel to ¾")	SP-GP	- No burned material visible				
	6												
				?	?	?	?	?	Partial recovery - compressed fill soils (?)				
	8												
				Silty Sand	Sticky	Red Brn	SILTY SAND - TR. CLAY (f-med sand, poorly graded, clay-sized particles)	SM-SC	Fill; wet (fines)				
	9												
					Loose	Tan Brn	SILTY SAND - SOME GRAVEL (f-med sand, poorly graded, f to subang + subrnd gravel to 1")	SM	- No burned material visible				
S-3			2.9'/4										
	10.9												
				?	?	?	?	?	Partial recovery - compressed soil (?)				
	12												
				EOB @ 12'			Refusal @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: See p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (do DT tracked rig

BORING No.: 34 - 138
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Note burned edge)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole BZ	Drillers BZ
	0	N/A											
				Topsoil + Mat	Loose	DK. Brn	SAND - ROOT MAT/ GRASS	SP/ FILL	Fill (topsoil); Dry				
	0.5						(f-med sand, tr. c. sand, poorly graded, organic roots)						
				Silt-Sand-Gravel Mix	Loose	Red Brn	SILTY SAND - SOME GRAVEL	SM	- No visible burned material				
							(f-med sand, tr. c. sand, poorly graded, f to c subrnd + subang gravels to 3/4")		- Damp				
	0.9												
5'			2.1/4'	Burned Mat. mixed w/soil	Loose	Blk	BURNED MATERIAL -	SW/ FILL	- Burned material mixed w/soil (minor %)				
	1.3						(Charcoal clinkers mixed w/ f-med, tr. c. sand, fines)		- Damp				
				Broken Rock	Loose	Gray	BROKEN ROCK -	Rock	- No visible burned material				
	1.6						QUARTZITE FRAGS TO 1"						
				Silty Gravel	Loose	Brn	SILTY GRAVEL - TR SAND	GM	Fill; wet to saturated (fines)				
							(Mostly f to c subang gravel to 1", fines, f. sand - poorly graded)						
	2.1												
				?	?	?	?	?	Partial recovery - compressed soil (?)				
	4												
				EOB @ 4' - refusal			Refusal @ 4'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: Burned material observed 0.9'-1.3' from top of S-1 liner (minor amt of charcoal clinkers). No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig)

BORING No.: 34 - 139
DATE: 4-24-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A					Asphalt surface						
	0.5			ASPHALT + ROADBASE	Loose	Blk-Gray	ASPHALT & GRAVEL ROAD BASE	FILL	Slightly plastic				
				SILTY GRAVEL	Loose	Brn	SILTY GRAVEL	GM	Fines are slightly				
					↓	↓	(Mostly f+c subrnd +	↓	plastic				
	1				↓	↓	subang gravel to 1", fines)	↓	- No burned mat. visible				
				SAND GRAV-MIX	Loose	DK Brn	SAND AND GRAVEL	SW/GW	Fill; dry				
					↓	↓	(f-c sand, well graded,	↓	- No visible				
5-1			1.4'		↓	↓	f+c subang + subrnd	↓	burned material				
1	1.2		4'		↓	↓	gravel to 3/4")	↓	↓				
				GRAV. BROKEN ROCK	Loose	Gray	GRAVEL & BROKEN ROCK		Fill; dry				
					↓	↓	(f+c subang. gravels to		↓				
	1.4			↓	↓	↓	1", coarse granite frags)		↓				
				?	?	?	?	?	Partial recovery -				
					↓	↓	↓	↓	Loose fill soil + rock frags -				
	4				↓	↓	↓	↓	too coarse to capture (?)				
			EOB @ 4'				Refusal @ 4'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No burned material observed. No cultural artifacts observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-200
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample/BZ	Borehole	Drill Site
	0	N/A					Asphalt Surface	SW					
				Asphalt + road base mat.	Loose	Blk-Gray	ASPHALT & ROADBASE	FILL	Fill; dry				
							(f-c sand, well graded, fines, f. ang. gravel to 1/2", asphalt, piece						
	0.6						of white paint)						
				Burn. mat w/ soil	Loose	Red Brn	SAND & GRAVEL - SOME BURNED MATERIAL	SW-GW					
						to Blk	f-c sand, well graded,		Clinkers mixed				
							f. subrnd gravel, c. ang-subang gravel to 3/4",		w/soil @ ~0.9-1'				
S-1			3'/4'	Burn mat. only			charcoal clinkers,		Layer of clinkers and furnace slag				
	1.4						furnace slag		@ ~1.1-1.4'				
				Sand-Grav. Mix	Dense	DK brn	SAND & GRAVEL - SOME SILT	SW-GW	Fill; damp				
							(f-med sand, tr. c. sand		- No burned mat. visible.				
							poorly graded, f-c subang + subrnd grav. to 3/4")						
	2.1												
				Sand Silt Mix	Loose	Tan Brn	SAND - SOME SILT - TR GRAVEL	SM	- Fill; damp				
							(f-med sand, poorly graded,		- No burned mat. visible				
	3						fines, f. subang gravel to 1/2")						
				?	?	?	?	?	Partial recovery				
	4								compacted fill soils (?)				
				Clayey SILT	Soft	DK brn	SILT - SOME CLAY - TR SAND	ML	Fill; saturated (fines)				
							Mostly silt + clay sized						
							particles, f. sand, poorly						
S-2	4.3		1'/1'				graded						
				Sandy GRAVEL	Loose	Tan Brn	GRAVEL - SOME SAND	GP	Fill; dry				
							(f. ang. gravel 1/4-1/2",						
	4.5						f. sand, poorly graded)						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed mixed w/ soil (~0.9-1'); distinct layer (no soil particles) @ 1-1.4'

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-200
DATE: 4-25-04
GEOLOGIST: K. Jalikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Borehole BZ
CONT.	4.5	N/A	CONT.										
1			1		Loose	DK brn	SAND - SOME GRAVEL	SW	Fill; dry				
5-2			1'/1'				(Mostly f-c sand, well		- No burned				
↓			↓				graded, f. subang-ang		material				
↓	5						gravel 1/4-1/2")		observed				
				EOB @ 5' - refusal			Refusal @ 5'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: See p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig)

BORING No.: 34 - 201
DATE: 4-26-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole	Drillers BZ
	0	N/A						Fill					
				Asphalt + Road Base	Loose	Blk-Gray	ASPHALT & ROADBASE (f-c sand, well graded, tr. silt, f. ang. gravel, c. ang-subang grav. to 1")	SW-GW	Fill; dry				
	0.8												
				Grav-Sand Mix	Loose	Tan Brn	GRAVEL-SOME SAND (f-c sand, well graded, c. gravel to 1")	GP	Fill; dry				
	1.1												
S-1			2.2'/3'	Burned Mat.	Loose	Blk	BURNED MATERIAL (Major components: charcoal clinkers, furnace slag, f-c sand size particles)		Burned material visible; dry				
	1.4												
				Sand	Loose	Bright Red	SAND-TR GRAVEL (f-m sand, tr. c. sand, poorly graded, f. sub-ang. gravel to 1/2")	SP	Fill; dry				
	1.8												
				Sand-Silt Mix	Loose	Tan Brn	SAND-SOME SILT-TR GRAVEL (f-med sand, tr. c. sand, poorly graded, f. ang. gravel to 1/2")	SM					
	22												
	3			?	?	?	?	?	Partial recovery - compressed soils (?)				
				EOB @ 3'			Refusal @ 3' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed 1.1-1.4' from top of S-1 liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig)
BORING No.: 34-202
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification Asphalt surface	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole	Driller BZ
	0	N/A						Fill					
				Asphalt + Road base	Loose	Gray-Blk	ASPHALT & ROADBASE	SW-GW	Fill; dry				
							(f-c sand, well graded,						
	0.7						tr. fines, f+c. ang. gravel)						
				Sand-Some Grav.	Loose	Bright Red	SAND - SOME GRAVEL - TR. SILT	SP	Fill; dry				
							(f-med sand, tr. c.						
S1	2.1		2.5' / 3'				sand, f+c subang. gravel to 1")						
				Sand-Grav Mix (more gravel than above)	Loose	Tan Brn	SAND AND GRAVEL	SW-GW	Fill; dry				
							(f-med sand, tr.		More gravel than above				
	2.5						coarse sand, f+c						
							subang. gravel to 1")						
				?	?	?	?	?	Partial recovery -				
									compressed loose fill soil (?)				
	3												
				EOB @ 3'			Refusal @ 3'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: No cultural artifacts observed.
No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (60 DT tracked rig)
BORING No.: 34 - 203
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification: Asphalt surface	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample Bag	Headspace	Drill Rig
	0	N/A											
	0.4			Asphalt	Loose	Blk	ASPHALT CHUNKS	Fill	Fill; dry				
				Burned Mat. and Soil Mixed	Loose	Blk	SAND - SOME SILT - SOME BURNED MAT. (f. sand, poorly graded, fines, f-c sand size particles, charcoal clinkers, furnace slag, red nodules, ash (trace amt.)	SM/ Fill	Burned material Mixed w/ soil and f-c sand size particles				
	0.8		1.9'/4'										
S-1				Sand-Grav Mix	Loose	Gray Brn	SAND & GRAVEL (f. med sand, tr. c. sand, poorly graded, (coarse subang. gravel to 2")	SP-GP	Fill; damp				
	1.3			- more silt	Loose	Red Brn	SAND & GRAVEL - TR SILT (f-c sand, well graded, f+c subang. gravel to 1.5" (pulverized pieces too))	SW-GW					
	1.9			?	?	?	?	?	Partial recovery - compressed fill soils (?) - not enough of a				
	4			EOB @4'			Refusal @ 4'		frictional force too keep material in liner (?); too gravelly (?)				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed mixed w/ soil 0.4'-0.8' from top of S-1 liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-204
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency Soil or Rock Hardness	Color	Material Classification Approx. Surface	USCS *	Remarks	PID/FID Reading (ppm): Sample Bag	Sample Jar	Borehole	Drill Rig
	0	N/A											
				ASPHALT + ROAD BASE	Loose	Blk	ASPHALT & ROADBASE	Fill	Fill; damp				
							(f-c sand, well graded,						
	1						f+c gravel 3/4-1")						
					Dense	Lt red	SAND - SOME SILT - TR GRAVEL	SM	Fill; damp				
			2.6'/4'	SAND-SILT MIX		brn	(f-med sand, poorly						
							graded, f. ang-subang.						
S-1	2.2'						gravel to 1/2")						
					Loose	Tan Brn	- similar to material above		less dense than				
							w/ quartzite rock		above; color				
	2.6						frags		change.				
				?	?	?	?	?	Partial recovery				
	4												
				Silty Sand	Denser	Tan Brn	SILTY SAND	SM	More dense (fines)				
							(f-med sand, poorly		than above;				
	4.3		1.5'/1.5'				graded, tr. amt. brick)		damp fill				
				Burned Mat.	Loose	Blk	BURNED MATERIAL -	Fill	Burned Mat.				
S-2							(Major components:		observed				
							charcoal clinkers						
	4.5						+ furnace slag mixed		Dry				
							w/ f-c sand size						
							particles)						
				Sand + Gravel	Loose	Red-orange	SAND & GRAVEL	SW-GW	Fill; dry				
							(f-c sand, well graded,						
							f+c ang-subang.						
	5.5						gravel to 1")						
				EOB @ 5.5'			Refusal @ 5.5'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed.
Burned material observed 4.3-4.5' or 0.3-0.5' from top of S-2 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-205
DATE: 4-25-04
GEOLOGIST: K. Jilkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample Surface	Sample BZ	Borehole	Drill Area
	0	N/A											
				Asphalt + Road base	Loose	Gray Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							(f-c subang. gravel to						
							3/4"; asphalt)						
	0.1												
				Burned mat. mixed w/ Silty Sand	Loose	Red Brn	SAND - SOME SILT - TR		- Burned mat.				
							BURNED MATERIAL	Fill	w/ soil (mixed)				
							(f-med sand, tr. c sand,	SM	- Fill; damp				
							poorly graded. fines,						
							4-5 pieces of scattered						
							charcoal clinkers +						
S1	0.4		2.7'				furnace slag (black)						
			4'	Silty Sand-Grav Mix	M. Dense	Tan Brown	SAND - SOME SILT - SOME	SM	- Fill; damp				
							GRAVEL		- No burned				
							(f-med sand, poorly graded,		material observed				
							f-c subang-subrnd						
	1.1						gravel to 1")						
				Broken rock	Loose	DK Gray	BROKEN ROCK	Rock	Fill; dry				
	1.2						- decomposed quartzite						
				Silty Sand	Loose	Tan Brn	SAND - SOME SILT - TR	SM	Fill; damp				
							GRAVEL						
							(f-med sand, poorly graded,		- No burned material				
							f. subang-subrnd gravel						
	2.2						to 1/2")						
				Sand + Grav. Mix	Loose	Tan Brn	SAND & GRAVEL	SW/GW	Fill; dry				
							(f-c sand, well graded,						
							f-c ang-subang gravel to 1")						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed mixed w/ soil @ ~0.1'-0.4' below top of S-1 liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig
BORING No.: 34-205
DATE: 4-25-04
GEOLOGIST: K Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Background	Sample 2X	Borehole	Drill Site
cont 2-2	0	N/A	cont.										
1			1	Sand Grav. Mix	Loose	Tan brn	Some gravels pulverized	SW	Fill; dry				
5-1			2.7		↓	↓	into silt size/clay	SW	↓				
↓	2.7		4		↓	↓	size particles)		↓				
↓			↓	↓	?	?	?	?	Partial recovery				
↓	4		↓		↓	↓	↓	↓	↓				
				EOB @ 4'			Refusal @ 4'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. See p. log 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6x6 DT tracked rig)

BORING No.: 34-206
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification (Asphalt, soil, rock)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	FID/PID	FID/PID BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
	1						(f. angular gravel to ½")						
				Sand-Silt-Grav-Mix	Loose	Red Brn	SAND-SOME SILT-SOME GRAVEL	SM-GM	Fill; dry				
							(f-c sand, well graded,						
			2.5				f+c ang-subang gravel						
5'	1.6		3'				to 1")						
				More grav in mix	Denser	Tan Brn	SAND AND GRAVEL - SOME SILT	SW-SP GW-GP	Fill; damp				
							(f-med sand, tr. c. sand						
							poorly graded, f+c						
	2.5						subang. gravel to 1.25")						
				?	?	?	?	?	Partial recovery-				
	3												
				EOB @ 3'			Refusal @ 3'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed.
No burned material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34 - 207
DATE: 4-25-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill Site
	0	N/A											
				Asphalt	Loose	Blk	ASPHALT LAYERS (2)	Fill	Fill; dry				
	1						(each layer 0.5' thick)						
				Burn. mat w/ soil	Loose	Brn-Blk	SAND-TR BURNED MAT.	SW/ Fill	Burned material				
							(f-c sand, well graded,		@ 1.2'-1.3'; dry				
	1.5		3.3'/4'				charcoal clinkers, Furn. slag)		(mixed w/ sand)				
S-1				Sand-Silt Mix	Loose	Pk brn	SAND-SOME SILT-TR GRAVEL	SM	Fill; damp				
							(f-med sand, poorly						
							graded, 1 piece coarse						
	1.9						subang. gravel to 1.5")						
					Loose	Tan Brn	- Similar to above	SM	Color change				
							except f+c subang.		Fill; damp				
	3.3						gravel to 3/4"						
				?	?	?	?	?	Partial recovery -				
	4								loose fill coils (?)				
							GRAVEL						
				Gravel	Loose	Gray	(f+c subang-ang gravel	GW	Fill; dry				
	4.3						to 1")						
S-2			1/2'	Pulverized Gravel	Loose	Gray	GRAVEL + PULVERIZED		Dust-like				
							GRAVEL/SOILS						
	6						(f-c sand, silt, clay-sized material)						
				EOB @ 6'			Refusal @ 6' Rock?						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural anth facts observed. Trace amt. burned material observed mixed w/ soil @ 1.2-1.3' from top of S-1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig
BORING No.: 34-208
DATE: 4-26-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Asphalt Surface)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
	0.7						(f-c ang-subang gravel to 1", well graded)	GW					
				More road base (?)	Loose	Brn	SAND-SOME SILT-TR GRAVEL	SM	Possibly more				
							(f-med sand, poorly graded,		roadbase fill;				
	1.3						f-c ang-subang. gravel to 1", asphalt pieces)		asphalt (cave-in mat.?)				
S-1	1.9		2.1'/4'	Broken Rock	Loose	Gray	BROKEN ROCK-1.5" pieces	Fill	Fill; dry				
				Sand	Loose	Brn	SAND-TR SILT-TR GRAVEL	SP	Fill; dry				
							(f-med sand, poorly graded						
	2.1						coarse subang. gravel to 1")						
				?	?	?	?	?	Partial recovery-				
	4								Forces not strong enough to capture gravelly soil (?)				
				Sand-Silt-Gravel Mix	Dense	Brn	SAND-SOME GRAVEL	SW-GW	-Sands are packed tightly				
							(f-c sand, well graded,						
	5.7		2.4'				f-c subang. gravel to 1")		w/gravel				
			3'		Dense	Brn	SAND-SOME SILT-SOME GRAVEL	SM-GM	-more fines				
S-2							(f-c sand, well graded,		than above				
	6.2						fines, f-c subang. gravel to 3/4")		Fill; damp				
				Broken Rock	Loose	Red Brn-Gray	BROKEN ROCK-quartzite fragments	Rock	oxidized pieces				
	6.4								(Fill?); dry				
				?	?	?	?	?	Partial recovery				
	7								-too coarse to capture (?)				
				EOB @ 7'			Refusal @ 7'-EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No buried material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Note: Extra drill location @ request of TENUS. Buried material was not observed @ 34-108 which would have required advancement @ 34-208. TENUS opted to check presence/absence of buried material to a nearby utility corridor.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-210
DATE: 4-24-04
GEOLOGIST: K Jaikut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification (Asphalt surface)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drillers BZ
	0	N/A											
				Asphalt + coarse roadbase	Loose	Gray Blk	ASPHALT & ROADBASE (f+c ang-subang-sub rnd gravel to 1", old asphalt fill pieces)	Fill	Fill; dry - vesicular texture bold asphalt pieces - No soil w/coarse pieces				
S-1	0.8		1.1'/4'										
	1.1			Road base? coarse silty gravel			GRAVEL-SOME SILT (c. ang. gravel to 1.5", poorly graded, fines)	SM	- Fill; wet (fines); more roadbase (?)				
	4			?	?	?	?	?	Partial recovery - too coarse to capture	(?)			
				Sand-Silt Mix	Softer	Brn	SAND-SOME SILT-TR GRAVEL (f. sand, poorly graded, fines, 1 piece of coarse subang. gravel to 1")	SP-SM	- Fill; damp (fines)				
	4.8		2.5'/4'										
S-2				Silty Sand Grav. Mix	Loose	Brn	SILTY SAND-SOME GRAVEL (f. sand, poorly graded, c. subang. gravel to 1")	SM-GM	- Similar to above w/more silt but less moisture (looser)				
	5.2			Sand-Grav. Mix	Loose	Brn	SAND-SOME GRAVEL (f-c sand, well graded, f+c subang. gravel to 1.5")	SW-GW	Fill; dry				
	6.5			Silty Sand Grav. Mix	Loose	Brn	SILTY SAND-SOME GRAVEL- (similar to material @ 4.8-5.2')	SM-GM	Fill; damp but material is loose				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 210
DATE: 4-24-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample No.	Sample BZ	Borehole	Drill BZ
4/4-24	6.5 Ø	N/A											
1			1		?	?	?	?	Partial recovery -				
5-2			2.5'/4'		↓	↓	↓	↓	compressed soil (?)				
(cont.) ↓	8		↓		↓	↓	↓	↓					
↑			↑		Loose	brn	SILTY SAND - SOME GRAVEL	SM-GM	Fill; damp				
5-3			0.5'/0.5'		↓	↓	(similar to material	↓					
↓	8.5				↓	↓	@ 6.2-6.5')	↓					
							Refusal @ 8.5' - gravel on bottom						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-Z11
DATE: 4-26-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification & Additional Comments	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							(f-c sand, well graded,		f. gravel mixed				
							f. ang. gravel to 1/2",		w/asphalt 0-0.5;				
							coarse subang gravel 1-1.25"; silt-sized		c. gravel 0.5-0.9'				
	0.9						particles)		- pulverized rock				
				Sand Silt Mix	Loose	Brn	SAND - SOME SILT	SM	Fill; wet				
							(f-c sand, well graded)		(fines)				
	1.1		1.6'/4'	Burned Mat.	Loose	Blk	BURNED MATERIAL -		Fill; damp				
							(major components: ash,						
S-1							charcoal clinkers, furnace slag, brick)						
							Mixed w/ f-c sand size						
							particles)						
	1.3			Sand-Silt Mix	Loose	Red Brn	SAND - SOME SILT	SP-SM	Fill; wet.				
	1.6						(f. sand, poorly graded)		(fines)				
				?	?	?	?	?	Partial recovery				
	4								compressed soil (?)				
			*	Gravel Fill	Loose	Gray	GRAVEL -	GP	Fill; dry				
S-2			0.5/0.5				(2 pieces coarse						
	4.5						gravel to 1.5")						
							poorly graded						
				EOB @ 4.5'			Refusal @ 4.5'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed 1.1-1.3' from top of S-1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-212A
DATE: 4-24-04
GEOLOGIST: K Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drilling BZ
	0	N/A											
					Loose	Blk	ASPHALT & ROADBASE	FILL	Fill; slightly				
					↓	↓	(f+c ang.-subang.	GW	plastic nature				
	1				↓	↓	gravel to 2")	↓	to asphalt				
					Loose	Brn	SAND	SP	Fill; dry				
	1.3				↓	↓	(f-med sand, poorly graded)	↓	↓				
S-1					Loose	Blk	BURNED MATERIAL-	Fill	No ash or				
			2'/2'		↓	↓	(furnace slag w/ f-c	↓	charcoal clinkers				
	1.6				↓	↓	sand-size particles)	↓	visible				
					Loose	Brn	SAND-SOME SILT-	SM-GM	Fill; damp				
					↓	↓	SOME GRAVEL	↓	↓				
					↓	↓	(f-med sand, poorly	↓	- no burned				
					↓	↓	graded, fines, f+c	↓	material				
					↓	↓	ang.+subang. gravel	↓	observed				
	2'				↓	↓	to 2")	↓	↓				
							Refusal @ 2'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed (furn. slag only) @ ~1.3-1.6' from top of S-1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-212B
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE (f-c sand, well graded, fine subang gravel to 1/2", coarse subang. gravel to 1")	Fill	Fill; dry				
	0.6			Sand	Loose	Tan Brn	SAND - TR GRAVEL (f-c sand, well graded, f. subrnd gravel 1/4-1/2")	SW	Fill; damp				
S-1	1		2.4'/4	Burn Mat. mixed w/ gravel	Loose	Blk	BURNED MATERIAL - (Major components: charcoal clinkers, furnace slag, mixed w/ f-c sand size particles (soil?) and coarse subang. gravel to 3/4" to 1")	Fill	Fill; damp; burned material mixed w/ gravel				
	~~1.4~~ 1.4			Sandy GRAVEL	Loose	Gray Brn	GRAVEL - SOME SAND - TR SILT (f. subang. gravel 1/4-1/2", c. subang. gravel to 1", f-c sand, well graded)	GW	Fill; damp				
	2.4			?	?	?	?	?	Partial recovery				
	4			Silty Gravel	Loose	Red Brn	GRAVEL - SOME SILT - TR SAND (f. subang. gravel to 1/2", fines, f. sand, poorly graded)	GM	Fill; wet (fines)				
S2	4.4		1.0'/4										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed 1-1.4' below top of S1 lines.

Converted to Well: Yes ____ No X Well I.D. #: ____

9.2
1.6
10.8

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-212B
DATE: 4-26-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No. (CONT.)	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ**	Borehole**	Driller BZ**
	4.4	N/A											
				Clayey SILT	M. stiff	Green Gray Brn	SILT-SOME CLAY-TR SAND (f. sand stringers in silt + clay-sized fines, poorly graded)	ML	Native (?) Wet (fines)				
S-2 CONT.	5.1		1.6' / 4'										
			CONT.		V. stiff		- similar to above		iron stains on f. sand stringers				
	5.6								Damp; stiffer				
	8			?	?	?	?	?	Partial recovery - compressed soil (?)				
	8.7			Clayey SILT	M. stiff	Green Gray Brn	SILT-SOME CLAY-TR SAND (similar to material @ 4.4-5.1')	ML	- less stiff				
S-3	9.2			Sand	Loose	Red Brn	SAND (Mostly f. sand, tr. med sand, poorly graded)	SP	- Dry				
			4' / 4	Clayey SILT	V. stiff	Gray Brn	SILT-SOME CLAY-TR SAND (Mostly silt + clay sized particles, f. sand, poorly graded (stringers)	ML	Damp				
	10.8				M. stiff				wet-sat.				
				Silty Gravel	Loose	Gray Brn	GRAVEL-SOME SILT-TR SAND (f-c ang. gravel to 3/4", well graded, fines, f-c well graded sand	GM	Saturated				
	12			EOB @ 12'			Refusal @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed 1-1.4' below top of S-1 liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig
BORING No.: 34-213
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	Fill	crumbly to slightly				
	0.8				↓	↓	(c. subang. arg. gravel to 1.5"	GP	plastic, nature to asphalt				
				More Roadbase fill (?)	Loose	Brn	SAND AND GRAVEL		- More roadbase				
							(f-c sand, well graded,		fill (?)				
	1.4'				↓	↓	c. arg. gravel to 1.25")	↓					
S-1				Burn. Mat.	Loose	Blk	BURNED MATERIAL -	Fill	- Fill; dry				
			2.8'/4'				(Major components: red		- No visible soil				
							nodules, vesicular						
							furnace slag, charcoal						
	2.1				↓	↓	clinkers)	↓					
				Silty GRAVEL	Loose	Brn	GRAVEL - SOME SILT - SOME SAND	GM	Fill; dry				
							(f+c arg. subang gravel to 1.5", fines, fine						
	2.8						poorly graded sand,						
					↓	↓	brick pieces)						
				?	?	?	?	?	Partial recovery -				
	4				↓	↓	↓	↓	compressed fill (?) too gravelly to capture (?)				
				Silty GRAVEL	Soft	Brn Gray	GRAVEL - SOME SILT - TR	GM	Fill; damp				
							SAND - TR BROKEN ROCK		(fines)				
							- similar to material						
							@ 2.1-2.8' w/ broken						
S-2	4.5		1.4'/4'		↓	↓	↓ quartzite chips	↓					
				Broken rock	Loose	Gray	BROKEN ROCK -	Fill	Fill; dry				
	4.8				↓	↓	quartzite fragments	↓					
				Clayey SILT	Soft	Brn Gray	SILT - SOME CLAY -	ML	Native ?				
							TR GRAVEL/RK FRAGS		wet (fines)				
					↓	↓	(silt & clay sized particles	↓					

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed ~1.4-2.1' below top of S-1 lines

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34 - 213
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	prior BZ
	(CONT. 4.8 ~~0~~)	N/A											
				Clayey SILT	Soft	Brn Gray	coarse ang. gravel to 1",	ML	wet (fines)				
	5.2				↓		quartzite fragments)	↓					
				Clayey Silt	V. stiff		SILT - SOME CLAY - TR SAND	ML	- less wet than above (more stiff)				
			1.4'/4'										
5.2 (CONT.)							(silt + clay sized particles, f. sand stringers - poorly graded)		- oxidized sand				
	5.4												
				?	?	?	?	?	Partial recovery - compressed soil (?)				
	8				↓	↓	↓	↓					
				M. Sand-Silt-Gravel Mix	Dense	Brn-Gray-Brn	SAND - SOME SILT - SOME GRAVEL - SOME ROCK CHIPS	SM	- Native (?)				
							(f-med sand, poorly graded, f to c ang. gravel to 1.5", rock fragments)		- Damp - oxidized sands				
5.3	10		3/4'										
							- similar to above material w/ more silt, wetness	SM	- wet (fines) - increased % of fines				
	11												
				?	?	?	?	?	Partial recovery - (compressed soil (?)				
	12				↓	↓	↓	↓					
				EOB @ 12'			EOB @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. EOB based on call by Cultural Resource Specialist - possibly into native material

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig

BORING No.: 34-214
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt + Roadbase fill	Loose	Blk	ASPHALT & ROADBASE	FILL	Fill; dry				
							(f. ang.-subang gravel to ⅛",	GW					
							c. ang.-subang gravel to						
	0.8						1.25"; glass shards, brick pieces)						
				gravelly SAND	Loose	Brn	SAND- SOME GRAVEL	SW	- Roadbase (?)				
							(f-c sand, well graded,		- Fill; damp				
	0.9						f. subang. gravel to ¼")						
					Loose	Blk	- Similar to above		- Fill; damp				
S-1	1		1.7'/3.5'				except color		- NOT BURNED MAT.				
				Gravel + rock frags			GRAVEL	GP	- Result of				
					Loose	Gray	(Angular shale to ⅛"		drilling (?)				
	1.3						thickness		- dry fill				
							GRAVEL		- Fill; dry				
							(coarse gravel to 1",						
							½" in thickness w/						
							pulverized rock frags						
	1.7						(f-c sand size pieces)						
				?	?	?	?	?	Partial recovery				
									Too gravelly to capture (?)				
	3.5												
				EOB @ 3.5'			Refusal @ 3.5'						
							Boulder?						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Note: Multiple attempts made. Advanced 3 boreholes on 4-24-04 - all met refusal @ ~2' bgs ... boulder? Relocated on 4/25 and redrilled. Moved at least 5' from original attempts.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60DT tracked rig

BORING No.: 34-215
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Background
	0	N/A											
				Asphalt + Roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE	Fill GW	Glossy stone to				
	0.7				↓	↓	(f+c angular gravel, well graded)	↓	asphalt				
				Burn Mat	Loose	Blk	BURNED MATERIAL -		- Fill; dry				
							(major components: charcoal		- Not mixed w/soil				
							clinkers, furnace slag)		(distinct layer)				
	0.9		1.3'/4'		↓	↓	↓		- No visible ash				
S1				Silty Gravel	Loose	Brn-Red	GRAVEL SOME SILT - TR	GM	Fill; dry -				
						Brn	SAND, TR ROCK CHIPS		damp				
							(coarse ang. gravel to 1.5",						
	1.3				↓	↓	fines, f. sand, poorly graded, quartzite frags)		↓				
				?	?	?	?	?	Partial recovery -				
					↓	↓	↓	↓	too gravelly or too				
	4								loose to capture (?)				
				Gravel + rock fill	Loose	Gray	GRAVEL - SOME BROKEN ROCK	GP	Fill; dry				
							(angular c. gravel to 1.5",						
	4.6				↓	↓	quartzite chips)	↓					
			1.1'/2'	Silty Gravel	Soft	Red Brn	GRAVEL - SOME SILT -	GM	- Damp (fines)				
S2							SOME CLAY						
							(c. ang. gravel to 2"						
	5.1				↓	↓	w/ silt + clay sized particles)	↓	↓				
				?	?	?	?	?	Partial recovery -				
	6				↓	↓	↓	↓	too gravelly to capture (?)				
				EOB @ 6'			Refusal @ 6'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed 0.7 - 0.9' below top of S-1 liner (distinct layer)

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-216
DATE: 4-23-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density Consistency Rock Hardness	Color	Material Classification Material Description	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Probe BZ	Drill BZ
	0	N/A											
				Asphalt Roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
						1	(coarse subang. gravel to 1" @ 0-0.5')	GP					
	0.8					Brn	(f-med sand, poorly graded ~0.5-0.8')		- dry				
				Sand Gravel Mix w/ organics	Loose	Blk	SAND - SOME GRAVEL -	SP	Dark colored but				
			2'/4'				SOME ORGANIC MAT.		is not a burn layer -				
							(f-med sand, poorly graded,		no visible components				
S-1							f. ang. gravel to 1/2",						
	1.8						non-charred wood)						
	2			FILL	Loose	Red	FILL - BRICK	Fill	Fill				
				?	?	?	?	?					
									- Brick pieces visible @ 4' -				
	4								likely cave-in mat.				
				Clayey SILT	Soft	Brn	SILT - SOME CLAY - TR SAND	ML	Fill (?); wet @ top of interval				
			1.9/4'		Stiff		- all fines (clay sized particles too)		Dry @ 4.5' - oxidized sand intervals				
	5.9				V. Stiff		- tr. f. ang. gravel to 1/2"		- oxidation prevalent				
S-2				?	?	?	?	?	Partial recovery -				
	8								compressed soil (?)				
				Sand-Gray-Silt-Clay Mix	Dense	Red Brn	SAND - SOME GRAVEL -	SM/GM	- Dry; till-like @ ~8'				
							SOME SILT - TR CLAY						
S-3			2'/2'				(f-c sand, well graded, c. ang gravel to 1", finest clay sized particles)						
	10			Rock Frag	Loose	Gray	ROCK FRAGMENTS -	RCK	- Bedrock ?				
							Refusal @ 10'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (60 DT tracked rig

BORING No.: 34-219A (1st run)
DATE: 4-25-04
GEOLOGIST: K. Bikist / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency Rock Hardness	Color	Material Classification (Where Sampled)	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Sand-Silt Grav. Mix	loose	DK Brn	SAND - SOME SILT - SOME GRAVEL - SOME ORGANIC MAT. (f-c sand, well graded, ftc avg-subang. gravel to 1.5", grass, roots)	SM	Fill; damp				
	1.6												
S-1			2.1/4'	Silty Sand-Grav w/ burned mat.	Denser		SILT AND SAND - SOME GRAVEL - TR BURNED MATERIAL (Similar to material @ 0-1.6' w/ more fines, trace % of charcoal clinkers, brick pieces)	SM FILL	Fill; damp (fines) - Scattered clinkers mixed w/soil and @ bottom 0.1' of sample				
	2.1												
	4			?	?	?	?	?	Partial recovery				
				EOB @ 4'			Refer to boring log labelled 34-219 (2nd run)						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Scattered burned material observed in interval from 1.6-2.1' of S-1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Note: Driller reported easy advancement - too easy. He relocated boring in case he was in the fill used to backfill the new drainage pipe.

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 219 A (2nd run)
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification (Grain size)	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drilling BZ
	0	N/A											
				Sand Silt Grav. Mix	Loose	Dk brn	SAND - SOME SILT - SOME GRAVEL - TR ORGANIC MAT. (f-c sand, well graded, f-c subang. + subrnd gravel to 3/4", grass, roots)	SM	Fill; damp Topsoil				
	0.5												
				Silt-Sand 2.4/5 Gravel Mix	Denser Loose	Dk brown	SILT & SAND - SOME GRAVEL - TR BURNED MAT. (similar to material from 0-0.15' w/ more fines; scattered clinkers observed 1-1.1' + 1.5-1.6', brick pieces)	SM FILL	Fill; damp-wet (fines); burned material mixed w/soil at 2 intervals				
5'-1			2.2'/4'	Burn. mat. mixed w/soil @ 2 intervals									
	1.6												
	1.8			PLASTIC	Loose	Gray	PLASTIC SHEETING	FILL	Man-made debris				
				Silty Sand w/ burn. mat. in soil (mixed)	Denser	Blk-Brn	SAND - SOME SILT - TR GRAVEL - TR BURNED MATERIAL (f-c sand, well graded, fines, f-gravel to 1/4"; charcoal clinkers)	SM	- Fill. Burned material mixed w/soil 1.8-2.2'				
	2.2												
				?	?	?	?	?	Partial recovery - compressed soil (?)				
	4												
				Silty Gravel	Loose	Brn	GRAVEL - SOME SILT - SOME SAND (f-c ang-subang gravel, fines, f-c sand, well graded, brick pieces, rock fragments)	GM	Fill; damp-wet				
	4.5												
	5			?	?	?	Refusal @ 5'		Partial recovery				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed 1-1.1', 1.5-1.6' - mixed w/soil; 1.8-2.2' - mixed w/soil. Depths relative to top of S-1 lines.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig

BORING No.: 34-219B (near silt fence)
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Soil or Rock)	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Drillers BZ
	0	N/A											
				Silty Sand Mix	Loose	Dk brn	SAND - SOME SILT - TR GRAVEL, TR ORGANIC MAT.	Fill Sm	Fill; damp				
							(f-med sand, poorly graded, f. gravel to 1/2", grass, roots)						
	0.8						SILT & SAND - TR GRAVEL -	SM					
				Silt + Sand (more fines) w/ burned mat.	Loose	Brn-Blk	TR BURNED MAT.	Fill	Burned material				
			1.7'/4'				(f-med sand, poorly graded fines, fine gravel, brick		(Clinkers only - scattered in soil)				
S-1							2-3 scattered pieces of charcoal clinkers)						
	1 ft			Silt-Sand-Grav.	Loose	Dk brn	SILTY SAND - SOME GRAVEL	SM	Fill; dry				
							(f-med sand, poorly graded, coarse subang. gravel to 2")						
	1.7												
				?	?	?	?	?	Partial recovery				
	4								- compressed soil (?)				
				Silty Sand + Gravel Mix	Loose	Dk brn	SILTY SAND - SOME GRAVEL	SM	Fill; damp				
							(f-c sand, well graded, f+c ang. subang. gravel)						
	5.2		2.1/3.5										
S-2				Sand + Gravel	Loose	Tan brn	SAND & GRAVEL - TR SILT	SW-SW	Fill; dry				
							(f-c sand, well graded, f+c ang. subang. gravel to 2")						
	6.1												
	7.5			?	?	?	Refusal @ 7.5 - EOB	?	Partial recovery				
				EOB@7.5									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material (trace percentage) observed scattered w/ soil in the 0.8-1' interval from the top of the S-1 liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-220
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Soils: Sand, Silt, Clay, Peat; Rocks: Type, Texture, Structure)	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole BZ	Drillers BZ
	0	N/A											
				Silty Sand	Soft	DK brn	SAND-SOME SILT-TR ORGANIC MAT.	SM	Topsoil-wet @ surface				
	0.3						(f-med sand, poorly graded, organic roots)						
				Sand + Gravel	Loose	Gray brn	SAND & GRAVEL-TR SILT	SW-GW	Fill; damp				
	0.9						(f-c sand, well graded, f+c subang. gravel to 1")						
				Silty Sand w/ burned mat.	Dense	DK brn	SAND-SOME SILT-SOME BURNED MATERIAL-TR GRAVEL	SM FILL	Fill; burned material mixed w/soil				
S-1			2.5'/4'				(f. sand, poorly graded, f. subang. gravel to 1/2", scattered charcoal clinkers to 1/4", furnace slag, red nodules to 1/8")						
	1.2			Sand-Gravel Mix	Loose	Red brn	SAND & GRAVEL (Mostly f-med sand, tr. coarse sand, poorly graded, f+c subang. gravel to 1.25")	SW-GW	Fill; dry				
	2.1			Broken Rock	Loose	Gray	BROKEN ROCK (quartzite fragments)	Rock	Fill; dry				
	2.5			?	?	?	?	?	Partial recovery				
	4						Refusal @ 4'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed mixed w/ soil @ ~0.9-1.2' from top of S-1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 221 A
DATE: 4-25-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency (Rock: Rock Hardness)	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample 1	Sample 2	Borehole	Pile 22
	0	N/A											
				Sand; Topsoil	Loose	Dk. Brn	SAND-TR SILT-TR	Fill	Topsoil; damp				
							ORGANIC MATERIAL						
							(f. sand, poorly graded,						
	0.5						organic roots)						
				Sand + Gravel	Loose	Gray Brn	SAND & GRAVEL-TR SILT	SW-GW	Fill; dry				
S1			2.8' / 4'				(f-c sand, well graded,						
	1.2						f+c subang-subrnd gravel to 3/4")						
				Silty Sand	M. Dense	Tan Brn	SAND-SOME SILT-TR	SM	Fill; dry				
							GRAVEL		- sand w/oxidized intervals				
							(f-med sand, tr. c. sand, poorly graded						
	2.8						f. subang. gravel to 1/2")						
				?	?	?	?	?	Partial recovery				
	4												
				EOB @ 4'			Refusal @ 4' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: No cultural artifacts observed. No burned material observed.

Drilling Area Background (ppm):

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-221B
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density Consistency (For Soil) Rock Hardness (For Rock)	Color	Material Classification (Grain Size, Soil Type)	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample EZ	Background	Drill EZ
	0	N/A											
				Sand	Loose	Dk brn	SAND-TR SILT-ORGANIC MATERIAL (f. sand, poorly graded, grass, organic roots	SP	Loam-like fill				
	0.6												
				Sand + Gravel	Loose	Gray Brn	SAND & GRAVEL-TR SILT (f-c sand, well graded, f+c subang. gravel to 1", brick pieces)	SW-GW	Fill; damp				
S-1			1.5'/2.5										
	1			Sand		Red Brn	SAND-TR SILT-TR GRAVEL (f-med sand, poorly graded, f. gravel to 1/4")	SP	Fill; damp				
					Loose								
	1.5												
				?	?	?	?	?	Partial recovery				
	2.5												
				EOB @ 2.5'			Refusal @ 2.5' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No burned material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - ~~Blue 221-222~~ 221-222 MID
DATE: 4-25-04
GEOLOGIST: K. Jaikist / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) or Screened Interval	Soil Quality Consistency Moisture Density	Color	Material Classification Grain Size Texture	USCS *	Remarks	PID/FID Reading (ppm) Background	Sample Zone	Borehole	Drilling Area
	0	N/A											
				Sand	Loose	Dk brn	SAND - TR SILT - TR ORGANICS	Fill	Topsoil; loam-like				
							(f-med sand, poorly	SP	damp				
	0.5						graded, grass, roots)						
				Sand + Gravel	Loose	Gray Brn	SAND & GRAVEL - TR SILT	SW-GW	Fill; damp				
S-1			1.2'/4'				(f-c sand, well graded,						
							f-c ang-subang. gravel						
	1.2						to 1.25")						
				?	?	?	?	?	Partial recovery				
	4												
				Sand + Gravel	Loose	Gray Brn	SAND & GRAVEL - TR SILT	SW-GW					
			3.4'/4'				- similar to material		some parts oxidized - incl. gravel surfaces				
S-2							@ 8.5 - 1.2'						
	7.4												
				?	?	?	?	?	Partial recovery				
	8								- compressed soil (?)				
				Silty Sand	Loose	Red Brn	SAND - SOME SILT - TR GRAVEL	SM	Fill; damp				
							(f-med sand, poorly						
S-3			2.5/2.5				graded, c. ang-subang.						
	9.2						gravel, tr. broken rock)						
				Broken rock	Loose	Dk Gray-wht	BROKEN ROCK -	Rock	Fill; damp				
	9.5						quartzite nodules, wht quartz nodules to 2"						
				Silty Sand	Loose	Red Brn	SAND - SOME SILT - TR GRAV.	SM	Fill; damp				
							similar to material @ 8-9.2'		wet (Gives)				
	10.5			EOB @ 10.5'			Refusal @ 10.5' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No burned material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34 - 222
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density Consistency or Rock Hardness	Color	Material Classification (Grain size, texture)	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Driller BZ
	0	N/A											
				Sand	Loose	DK Brn	SAND - ORGANIC MAT.		Loam-like; dry;				
							(f. sand, poorly graded		fluffy				
	0.8						organic roots, grass)						
				Sand Silt Gravel Mix	Loose	Gray Brn	SAND - SOME SILT - SOME	SW-SM	Fill; dry				
							GRAVEL						
							(f-c sand, well graded,						
							f+c ang-subang.						
	1.5						gravel to 1.5")						
S-1			2.8/4'	Silty Sand	Loose	DK Brn	SAND - SOME SILT - TR	SM	Fill; dry				
							GRAVEL						
							(f. sand, poorly graded,						
	1.8						f. subang. gravel to ½")						
				Sand Silt Grav. Mix	Loose	Tan Brn	SAND - SOME SILT - SOME GRAVEL	SM-GM					
							(f-med sand, poorly graded,						
							coarse ang-subang gravel						
	2.8						to 1.5")						
				?	?	?	?	?	Partial recovery				
	4								Fill; dry				
				Silty Sand	Denser	Tan Brn	SAND - SOME SILT	SM	Fill; damp				
	4.6						(f-med sand, poorly graded)						
				Broken rock	Loose	Red Brn	BROKEN ROCK -	Rock	Fill; dry				
S-2	5.3		1.3/2				quartzite chips		weathered oxidized surfaces to rock				
				?	?	?	?	?	Partial recovery				
	6												
				EOB @ 6'			Refusal @ 6' - EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-223
DATE: 4-24-04
GEOLOGIST: K Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample B.Z.	Borehole	Drill Site B.Z.
	0	N/A											
	0.3			Topsoil	Loose	Brn	Topsoil; organic roots	Fill					
	0.3				Loose	BLK	Filter Fabric	Fill	No discernable thickness				
				Burned Mat.	↓	↓	BURNED MATERIAL -	Fill					
	0.55				Loose	DK Gray	- Ash, furnace slag		Distinct layer				
	0.7		1.8'		↓	↓	- burned fibrous mat. + organic roots						
S1	0.8		4'		Loose	BLK-Gray-Red	- ash (offwht)		Distinct layer				
							- charcoal clinkers, ash		Mixed w/ soil-like particles				
							furnace slag, charred						
	1.5						wood dispersed in f-c sand size particles						
	1.8				↓	Off wht	- ash	↓	Distinct Layer				
				?	?	?	?	?	Partial recovery -				
↓	4		↓		↓	↓	↓	↓	compressed fill (?)				
				Burned Mat.	Loose	Gray BLK	BURNED MATERIAL -	Fill	Not mixed w/ soil; fill				
					↓	↓	- Mixture of ash, furnace						
	4.5				↓	↓	slag, charcoal clinkers	↓					
					M. Dense	Brn	SAND-SOME SILT-SOME GRAVEL SOME BURNED MAT.	SM-GM	Mixed w/ soil				
					↓	↓	(f-c sand, well graded,	Fill					
S2	4.8		1.8' / 4'		↓	↓	fines, c. gravel to 3/4") charcoal clinkers	↓	Damp; fill				
							SAND-SOME SILT-SOME BURNED MATERIAL	SM Fill					
							(f-c sand, well graded,		Mixed w/ soil;				
							fines, charcoal clinkers,		Damp-wet				
	5.1				↓	↓	brick)	↓					
				Silty Sand		Brn	SAND-SOME SILT	SM	NO BURNED MAT.				
							(f-c sand, well graded,		OBSERVED;				
	5.3			↓	↓	↓	brick pieces)	↓	WET				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed 0.3-1.8' from top of S-1 lines; 4-5.1' relative to S-1 lines (11 to 11' from top of S-2 lines)

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig
BORING No.: 34-223
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (FL) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/FL) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill Area
KJ 4-24-04	CONT. 5.3 ~~0~~	N/A											
				Clayey SILT	Stiff	Gray Brn	SILT & CLAY - SOME SAND	ML	- Mottled coloration				
							(Mostly silt, some clay-sized		- Oxidized sand				
							particles, f. sand, poorly		- Damp only				
	5.8						graded)		- No burned mat. observed				
				?	?	?	?	?	Partial recovery -				
	8								compressed fill (?)				
				Clayey SILT	Soft	Gray Brn	SILT & CLAY	ML	Saturated				
							(Mostly silt, some clay-						
	8.7						sized particles						
			2.2' / 4'	Silt-Sand-Grav Mix	Loose	Gray Brn	SAND - SOME SILT - SOME	SM-	No burned				
5.3							GRAVEL	GM	material observed				
							(f-med sand, poorly						
							graded, f to c subrnd +						
							subang. gravel to 1")						
	10.2			?	?	?	? ?	?	Partial recovery -				
	12								compressed soil (?)				
				EOB @ 12'			Refusal @ 12'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed.
See remarks p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-224
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample-EZ	Borehole	Borehole-EZ
	0	N/A											
				Sand-Grav. Mix	Loose	Brn	SAND - SOME GRAVEL -	SW	Topsoil; damp				
							SOME ORGANIC ROOTS	Fill	- No burned material visible				
							(f-c sand, well graded,						
							fine subrnd gravel to 1/4";						
	0.4						organic roots, grass)						
				Burned mat	Loose	Blk	BURNED MATERIAL -		Burned material				
							- charcoal clinkers		w/ sand-size				
	0.7		1.6'				mixed w/ f-c sand size particles		particles				
5'			3.5	Sand-Silt-Grav. Mix	Loose	Brn	SAND - SOME SILT - SOME	SM/GM	Fill; damp;				
							GRAVEL		no visible				
							(f-med sand, tr. c. sand,		burned material				
							poorly graded, f-c						
							subang. + subrnd						
	1						gravel to 1.25")						
					Sl plastic	Blk	SAND - SOME SILT -	SM	Fill; damp				
				- w/ organics			SOME GRAVEL - TR		- Fines slightly				
							ORGANIC MATERIAL		plastic				
							(f-med sand, poorly		- No burned				
							graded, f. gravel		material				
							to 1/2", wood, fibrous		observed				
	1.3						material, organic (peat?)						
	1.6			ROCK	Loose	Gray	BROKEN ROCK	Rock	Fill				
				?	?	?	?	?	Partial recovery				
	3.5								-				
				EOB @ 3.5'			Refusal @ 3.5'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed 0.4-0.7' from top of 5' liner - mixed w/ sand-size particles.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-225
DATE: 4-24-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donnigan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency Rock Hardness	Color	Material Classification Lithologic Description	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Drillers BZ
	0	N/A											
				Asphalt roadbase	Loose	Blk Brn	ASPHALT & ROADBASE	Fill	Fill; dry				
	0.35						(c. subrnd gravel to 3/4")	GP					
				Silty GRAVEL	Soft	Brn	GRAVEL - SOME SILT -	GM	- Fill; wet				
							SOME SAND	Fill	- No burned				
			1.3' / 4'				(f-med sand, poorly		mat. visible				
							graded, fines, f+c						
	0.8						subang. gravel to 1.25")						
S-1				Broken rock sand-silt mix	Loose	Gray Brn	SAND - SOME SILT -	SM	Fill; damp				
							BROKEN ROCK	Fill	(more rock than				
							(f-med sand, poorly		soil)				
	1.3						graded, rock frag)		- No burned mat. visible				
				?	?	?	?	?	Partial recovery				
	4												
				Mostly broken rock	Loose	Gray Brn	BROKEN ROCK - TR	Fill	- No burned				
			0.5' / 1.5				SAND - TR SILT		mat. visible				
S-2							(similar to above w/						
	4.5						less soil)						
				?	?	?	?	?	Partial recovery				
	5.5												
				EOB @ 5.5'			Refusal @ 5.5'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34 - 226
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt	Loose	Blk	ASPHALT CHUNKS w/	Fill	Dry; Fill				
	0.5				↓	↓	WHT PAINT	↓					
				Gravel	Loose	Brn	SAND & GRAVEL	SW/GW	Damp; Fill				
							(f-c sand, well graded,		Roadbase ?				
							f-c subang-subrnd -						
	1.2		1.8'/4'				round gravels to 1.5")						
				Gravel + Broken Rock	Loose	Gray	GRAVEL - SOME BROKEN ROCK	GP/rock	Dry; Fill				
S1							(c. gravel to 1.5",						
	1.5						quartzite frags.)						
				Gravelly SAND	Loose	Red Brn	SAND - SOME GRAVEL	SP	Dry; fill				
							(f-med sand, tr. c. sand,						
							fine subrnd gravel to						
	1.8						1/2")						
				?	?	?	?	?	Partial recovery				
	4								- too gravelly to capture (?)				
				Sand-Grav-Silt-Clay Mix	M. Dense	Dk Red Brn	SAND & GRAVEL -	SM/GM	- oxidized				
							SOME SILT - TR CLAY		sands (iron				
							(f-c sand; well graded,		stains evident)				
							f-c subang. gravel		- Fill; damp				
S2							to 3/4", silt & clay						
	5						sized particles)						
	6			Sand	Loose	Tan Brn	SAND - TR SILT	SP	Fill; dry				
	6.2						(f-med sand, poorly graded)						
	6			Gravel	Loose	Dk Gray	GRAVEL	GP					
	6.3						(Coarse ang. gravel to 1")						

KJ 4-26-04

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (DOT tracked rig)

BORING No.: 34 - 226
DATE: 4 - 26 - 04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density Consistency Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Background	Sample BZ	Borehole BZ	Drill BZ
4-26-04	0-3	N/A											
↓			↓	?	?	?	?		Partial recovery				
↓	7		↓		↓	↓	↓		↓ - compressed soil (?)				
				EOBC 7'			Refusal @ 7'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. See p. 1 of 2.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-227
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drilling BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	Fill	Wet (raining)				
							(f-c sand, well graded,	SW					
							c. gravel to 3/4", wht.						
	0.3						paint, asphalt)						
			1.7	Sand-Grav Mix	Loose	Red Brn	SAND & GRAVEL - TR SILT	SW	Fill - Moist/damp				
S-1			4'				(f-c sand, well graded,	SW					
							f. subrnd gravel to 1/2",	Fill					
	1.4						c. subang gravel to 1")						
					Loose	Tan Brn			Moist/damp				
							- similar to above						
							except for color						
	1.7												
				?	?	?	?	?	Partial recovery				
	4												
				Silty Gravel some Sand	Denser	Brn	GRAVEL - SOME SILT -	GM	Fill; saturated				
							SOME SAND	Fill					
			1.1'				(Mostly c. subang gravel						
S-2			2'				to 1", fines, f-c well						
	5.1						graded sand)						
				?	?	?	?	?	Partial recovery				
	6								- top gravelly to fracture (?)				
				EOB @ 6'			Refusal @ 6'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No burned material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-228
DATE: 4-26-04
GEOLOGIST: K Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Test Hole	Sample Bag	Borehole	Drill Rig
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	FILL	Fill; dry				
							(f-c sand, well graded,						
	0.7						f-c subang gravel to 3/4")						
				Sand-Grav. Mix	Loose	Red Brn	SAND & GRAVEL - TR SILT	SW/GW	Fill; dry				
S-1			1.3'/4'				(f-c sand, well graded,						
							f-c subang - subrnd						
	1.3						gravel to 1")						
				?	?	?	?	?	Partial recovery				
	4								- too coarse to capture (?)				
				Silty Gravel	Loose	Dk Brn	GRAVEL - SOME SILT -	GM					
							SOME SAND		- Interval @				
							(Mostly subrnd gravel		4.2-4.7' is				
							to 2", ang-subang		colored blk but				
							coarse gravel to 1", fines,		does not appear				
S-2	4.7		1.1/2'				f-c well graded sand)		to be burned material -				
4-26-04	4.7								no visible components				
				Grav + Br. Rock	Loose	Dk Gray	GRAVEL / BROKEN ROCK	GP/Fill					
							(coarse gravels +						
	5.1						quartzite frags to 1.5")						
				?	?	?	?	?	Partial recovery				
	6								- too coarse to capture (?)				
				EOB @ 6'			Refusal @ 6'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No burned material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60 DT tracked rig

BORING No.: 34-250
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt + roadbase	Loose	Gray Blk	ASPHALT + ROADBASE	Fill	Fill; dry				
							(f-c sand, well graded,						
							f+c ang-subang						
	0.9						gravel to 1")						
				Sand + Gravel	Loose	Gray Red	SAND & GRAVEL - TR SILT	SW	Fill; dry				
						Brn	(f-c sand, well graded,	GW					
	1.3						f+c ang gravel to 3/4")						
4-25-04	1.5			Sand + Burned Mat.	Loose	Blk-Brn	SAND - SOME BURNED	SW/	Fill; dry				
							MATERIAL - TR SILT -	Fill	- Visible burned				
S-1			3.3'/4'			Gray	TR GRAVEL		material				
							(f-c sand, well graded,		mixed w/ soil				
							charcoal clinkers, ash,						
							furnace slag, tr. fines,						
	1.6						tr. f+c gravel to 3/4")						
				Sand	Loose	DK Brn	SAND - TR SILT - TR GRAVEL	SP	Fill; dry				
							(f-med sand, poorly						
							graded, fine subang.						
	1.9						gravel to 1/2")						
					Loose	Red	SAND - TR SILT	SP	Fill; dry;				
						Orange	(f-med sand, poorly		oxidized sands				
	2.8						graded)		(iron stained)				
					Loose	Tan	SAND - TR SILT	SP	Fill; dry;				
	3.1						(f. sand - poorly graded)		oxidized sands				
	3.3			Broken Rock ?	Loose	DK Gray	BROKEN ROCK	Rock	Fill; dry				
	4				?	?	Refusal @ 4'		Partial recovery				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Note - burned material mixed w/ soil visible at ~1.3-1.6' from top of S-1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-251
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density Consistency Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole BZ	Driller BZ
	0	N/A											
				Asphalt + roadbase	Loose	Gray-Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							(f-c sand, well graded,						
							f+c ang-subang gravel						
	0.9						to 1", tr. Fines)						
				Sand + Gravel	Loose	Tan-Gray	SAND & GRAVEL - TR SILT	SW	Fill; dry				
						Brn	(f-c sand; well graded,	GW	- Roadbase?				
	1.4						f+c subang gravel to 1")	Fill					
			3.3/4'	Sand	Loose	Bright Red-Orange	SAND - TR GRAVEL -	SP	Fill, dry				
S-1							TR SILT						
							(f-med sand, poorly	SP					
							graded, f. subang.						
	2.1						gravel to 1/2")						
					Loose	Light Orange	- similar to above		- 1" interval of				
							except lighter in color		broken rock				
	2.7												
				gravelly SAND	Loose	Gray Brn	SAND - SOME GRAVEL -	SP	Fill; dry				
							TR SILT						
							(f-med sand, poorly						
							graded, f. subang.						
	3.3						gravel to 1/2")						
				?	?	?	?	?	Partial recovery				
	4												
				Silty Sand			SAND - SOME SILT - TR						
S-2			1 1/2'				GRAVEL						
							(f-med sand, poorly graded						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. No layered material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-251
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No. (Int.)	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency, Color, Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole BZ	Drilling BZ
	4	N/A									
	5			Silty Sand	Loose / tan brn / f. gravel to 1/2")	SM	Damp; fill				
					? / ? / ?	?	Refusal @ 6'				
	6										
				EOB @ 6'	Refusal @ 6'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. See p. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig
BORING No.: 34-252
DATE: 4-25-04
GEOLOGIST: K. Jaikirt / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	Fill	Fill; dry				
							(f-c sand, well graded,						
	0.7						f-avg. gravel, asphalt)						
				Burned Mat.	Loose	Blk	BURNED MATERIAL	Fill	- Burned material				
							(1-2 pieces glassy		w/ sand size				
							charcoal clinkers in f-c sand size		particles -				
	1						matrix)						
	1.2			Soil?			- F-C SAND SIZE PARTICLES ONLY		SOIL?				
S-1				Silty Sand	M. Dense	Red Brn	SAND - SOME SILT -	SM	- No burned				
			2.8				TR GRAVEL		material				
			4				(f-med sand, poorly		observed				
							graded, c. subrnd.						
	1.5						gravel to 2")						
				Burned Mat.	Loose	Blk	BURNED MATERIAL	FILL	- Distinct layer				
	1.6						(charcoal clinkers, furnace slag)		burned material				
				Silty Sand	M. Dense	Red Brn	SAND - SOME SILT - TR	SM	- No burned				
							GRAVEL		material observed.				
	1.8						(Similar to material @ ~1.2-1.5)						
				Burned Mat	Loose	Blk	BURNED MATERIAL -	Fill	Distinct layer -				
	2						(Charcoal clinkers)		burned material				
				Silty Sand	M. Dense	Red Brn	SAND - SOME SILT - TR	SM	- No burned				
							GRAVEL		material observed				
	2.2						(Similar to material @ ~1.6-1.8')						
				Gravelly Silty Sand w/ burn. mat.	M. Dense	Tan Brn	SAND - SOME SILT -	SM/Fill	Fill; damp				
							SOME GRAVEL - SOME BURNED MAT.						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed ~0.7-1.0', 1.5-1.6', 1.8-2', 2.2-2.8' from top of S-1 lines.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig

BORING No.: 34-252
DATE: 4-25-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sample Nozzle	Borehole	Drill Rig
	2.2 ~~0~~	N/A											
				Gravelly Silty Sand w/ Burn. Mat.	M. Dense	Tan Brn	(fined sand, poorly graded, fines, tr c dry-subang. gravel to 1", ash, charcoal clinkers, furnace slag mixed w/soil)	SM FILL	Fill, damp - Burn material mixed w/soil - No distinct layers.				
S-1			2.8 / 4'										
	2.8												
				?	?	?	?	?	Partial recovery				
	4												
				EOB @ 4'			Refusal @ 4'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. See p. 1072

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-253
DATE: 4-26-04
GEOLOGIST: K. Jaikirt / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency, Rock Hardness, Weathering	Color	Material Classification & Description	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Driller BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE	FILL	Fill; dry				
							(f-c sand, well graded,	SW/GW					
	0.8						f+c angular gravel)						
				Gravel Sand Mix	Loose	Blk to Gray Brn	GRAVEL-SOME SAND-TR	GP					
							SILT		Fill; damp				
							(coarse ang-subang gravel						
							3/4"-1", f-c well graded						
S-1	1.1						Sand)						
			2.7' / 4'	Silty Sand	M. Dense	Red Brn	SAND-SOME SILT-TR	SM	Fill; damp				
							GRAVEL						
							(f-med sand, poorly graded,						
							fines, coarse subang.						
	1.9						gravel to 1")						
				Clayey SILT	Soft	Red Brn	SILT & CLAY-TR SAND	ML	Fill; saturated				
							(Mostly silt + clay sized		(fines)				
							particles, f. sand, poorly						
	2.4						graded)						
				Silty SAND	Loose	Tan Brn	SAND-SOME SILT-TR	SM	Fill; dry				
							GRAVEL						
							(f-med sand, poorly						
							graded, fines, fine						
	2.7						angular gravel to 1/2")						
				?	?	?	?	?	Partial recovery				
	4								compressed soil (?)				
S-2					Loose	Tan Brn	SAND & GRAVEL	SW	Fill; dry				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: No cultural artifacts observed. No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-253
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample No.	Sample BZ	Borehole	Drilling BZ
1 (cont. 4)		N/A	1	Sand + Grav.	Loose	Tan Brn	(f-c sand, well graded, f. subangular gravel to ½")	SW	Fill; dry				
S-2			0.3 / 1'										
	4.3				?	?	?	?	Partial recovery				
	5			EOB @ 5'			Refusal @ 5'						

(cd 4-26-04)

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. See p. 1 of 2.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-254
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density or Strength / Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Simplo-FIA	Borehole	Drilled-FIA
	0	N/A											
				Asphalt Roadbase	Loose	Gray Blk	ASPHALT & ROADBASE (f-c sand, well graded, f+c ang. gravels to 1")	Fill	Fill; dry				
	0.7			gravelly SAND	Loose	Tan Brn	SAND - SOME GRAVEL (f-c sand, well graded, f ang. gravel 1/4-1/2")	SW	Fill; dry				
	1			Burned Mat.	Loose	Blk	BURNED MATERIAL (major components: Charcoal clinkers, furnace slag, red nodules)	Fill	Burned material Dry (not mixed w/soil)				
5.1			3.5'/4'										
	1.4			Sand-Grav. Mix	Loose	Tan Brn	SAND & GRAVEL (f-c sand, well graded, c. subang. gravel to 1.5")	SW	Fill; dry				
	1.7			Silty Sand	M. Dense	Red Brn	SAND - SOME SILT - TR GRAVEL (f. sand, poorly graded, fines, 1 piece coarse subang. gravel to 3/4")	SM	Fill; damp				
	2.1			more gravel	M. Dense	Tan Brn	- similar to above w/ more than 1 piece of gravel	SM	Fill; damp				
	3.3			Gravel	Loose	Gray	GRAVEL - coarse angular	GP	Fill; damp				
	3.5												
	4			EOB @ 4'	?	?	? refusal @ 4'	?					

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material observed ~1-1.4' from top of 5.1 liner.

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 66DT tracked rig

BORING No.: 34-255
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density Consistency Moisture Color Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample Zone	Sample Top	Sample Bottom
	0	N/A											
				Asphalt + Roadbase	Loose	Blk	ASPHALT & ROADBASE (f-c sand, well graded, f-ang. gravel to 1/2")	Fill	Fill; dry				
	0.8			gravelly SAND road base?	Loose	Red Brn	SAND-SOME GRAVEL (f-c sand, well graded, f-ang. gravel 1/4-1 1/2")	SW Fill	Fill; dry - Roadbase (?)				
	1.1			Burned Mat.	Loose	Blk	BURNED MATERIAL (charcoal clinkers; nodules, off wht-colored ash, brick, mixed w/ f-c sand size particles)	Fill	- Burned Mat - Fill; dry - Tr. amt. of ash				
5-1			2.7' / 3'										
	1.5			Silty sand	Loose	Red Brn	SAND-SOME SILT-TR GRAVEL (f. sand, poorly graded, f. subang. gravel to 1/4", brick)	SM	Fill; damp				
	1.8			Silty Sand	M. Dense	Light Red	SAND-SOME SILT (f. sand poorly graded)	SP	Black layers ~1mm thick (?)				
	2.1			- More gravel	M. Dense	Tan Brown	SAND-SOME SILT-SOME GRAVEL (f. sand, poorly graded, fine s-ang-ang. gravel to 1/2" c. subang gravel to 3/4")	SM	Fill; damp				
	2.5			Gravel	Loose	Brn	GRAVEL-(f-ang. gravel to 1/2")	GP	Fill; dry				
	2.7												
	3			EOB@3'	?	?	? Refusal @ 3'	?	Partial recovery				

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed ~1.1-1.5' from top of 5-1 liner.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance 60 DT tracked rig

BORING No.: 34 - 256
DATE: 4-26-04
GEOLOGIST: K. Jaikirt / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample No.	Sample Depth	Borehole	Drillers
	0	N/A											
				Asphalt + Road base	Loose	Gray Blk	ASPHALT & ROADBASE (f-c sand, well graded, f+c angular gravel to 3/4")	Fill	Fill; dry				
	0.9												
				Sand + Burned Mat.	Loose	Tan Brn	SAND - TR BURNED MAT. (f-c sand, well graded, scattered black charcoal clinkers)	SW / Fill	Fill; damp / Burned material mixed w/soil				
	1.2												
S1			1.9/4'	Sand	Loose	Gray Brn	SAND - TR GRAVEL (f-c sand, well graded, f. subang. gravel to 1/4")	SW	Fill; damp				
	1.4												
				Burned Mat.	Loose	Blk	BURNED MATERIAL (charcoal clinkers, furnace slag (1 piece up to 1" diam.)	Fill	Fill; damp; not mixed w/soil				
	1.8												
				Silty Sand	M. Dense	Red Brn	SAND - SOME SILT - TR GRAVEL (f. sand, poorly graded, f. gravel to 1/2")	SM	Fill; damp / Unidentified dk brn laminations				
	1.9												
				?	?	?	?	?	Partial recovery - compressed soil (?)				
	4												
S2			1.5/4'	Clayey SILT	Soft	Gray Brn	SILT - SOME CLAY - SOME SAND - TR GRAVEL (Mostly silt, clay-sized particles; f. sand, poorly graded, c. ang. gravel to 1" poorly graded)	ML	Fill (?); wet				
	5												

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed mixed w/soil ~0.9-1.2'; distinct layer ~1.4-1.8' from top of S1 liner

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (60 DT tracked rig

BORING No.: 34-256
DATE: 4-26-04
GEOLOGIST: K. Jaikut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density Consistency Or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample Bag	Borehole	Borehole Bag
5		N/A		Clayey SILT	V. Stiff	Lt Gray Brn	SILT - SOME CLAY - TR SAND (Moisty silt, clay-sized particles, fi sand, poorly graded)	ML	Native (?); damp (less moisture than above)				
	5.5												
				?	?	?	?	?	Partial recovery (compressed soil (?))				
	8												
5-3			1' / 1'	Silty Sand	M. Dense	Tan Brn	SAND - SOME SILT - SOME GRAVEL (f-med sand, poorly graded, fine subang + subrnd gravel (to ½))	SM	Mottled coloration (Reddish/Gray) Damp - iron oxide stains on sand				
	9												
				EOBR 9'			Refusal @ 9'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Seep. 1 of 2

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: Yarmouth Environmental Services
DRILLING RIG: Geoprobe Advance (6DT tracked rig

BORING No.: 34-257
DATE: 4-26-04
GEOLOGIST: K. Jalkut / S. Anderson
DRILLER: R. Donagan / M. Chase

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/Consistency Hardness Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole	Drill BZ
	0	N/A											
				Asphalt + Roadbase	Loose	Gray Blk	ASPHALT & ROADBASE (f. ang. gravel 1/4-1/2", c. ang-subang grav. to 1")	Fill	Fill; dry				
	0.6												
				Sand	Loose	Red Brn	SAND (f-c, well graded)	SW	Fill; damp				
	0.9												
S-1			1.8'/4'	Burned Mat.	Loose	Blk	BURNED MATERIAL - (major components: furnace slag, red nodules, trace ant. offwht. ash, charcoal clinkers)	Fill	Fill; dry - Not mixed w/soil				
	1.3												
				Sandy GRAVEL	Loose	Brn Red Brn	GRAVEL - SOME SAND (f-c angular gravel to 3/4", f-c well graded sand)	GW/SW	Fill; dry				
	1.8												
				?	?	?	?	?	Partial recovery				
	4			EOB @ 4'			Refusal @ 4'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: No cultural artifacts observed. Burned material observed ~0.9-1.3' from top of S-1 liner (not mixed w/ soil)

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-1
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole**	Drillers BZ
	0	N/A	N/A				Grass surface						
↑				Root Mat w/ Sand-Silt Mix	Loose	Dk Brn	SAND-SOME SILT-SOME	SP-SM	Topsoil; damp				
							ORGANICS-TR GRAVEL		- No burned material visible				
S-1							(f-med sand, poorly graded f. subrnd gravel to ½",						
↓	0.5				↓	↓	organic roots + grass)	↓					
↑				Sand-Silt-Gravel Mix	Loose	Tan Brn	SAND-SOME SILT-SOME GRAVEL	SW-GW	Fill; damp				
							(Mostly f-c, well graded sand,						
S-2							some fines, some f. subrnd to subang gravel to ½",		- No burned material visible				
↓	1				↓	↓	coarse subrnd, subang. gravel to 1")	↓					
↑				Burned Material	Loose	Blk	BURNED MATERIAL-	Fill	Distinct layer-				
S-3							(Charcoal clinkers, furnace slag, charred		not mixed w/soil				
↓	1.4			EOB @ ~1.4'	↓	↓	wood)	↓	No visible ash				
							Refusal @ ~1.4' -						
							hard bottom -						
							possibly lg. cobble						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed.
Burned material observed 1-1.4' bgs - mixed components.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-2
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole	Driller BZ
	0	N/A	N/A				GRASS SURFACE						
↑				Topsoil-Root Mat	Loose	DK brn	SAND-SOME SILT-SOME ORGANICS	SP-SM	Topsoil/Root mat.				
S-1					↓	↓	(Mostly f-med sand, poorly		Damp fill				
↓	0.5						graded, fines, organics (roots, grass))	↓	- No burned material observed.				
↑				Sand-Grav. Mix	Loose	Tan brn	SAND & GRAVEL-SOME SILT	GM					
S-2					↓	↓	(f-c sand, well graded,	↓	Fill; damp				
↓	0.9						f+c subang gravel to 1", some fines)		- No burned material visible				
↑				Soil w/ Burned Material	Loose	DK brn	SILTY SAND-SOME GRAVEL-	SM-					
S-3					↓	↓	SOME BURNED MATERIAL	GM	- Burned material mixed w/ soil				
							(f-c sand, well graded, f+c		(few pieces)				
					↓	↓	subang gravel to 1", fines (clay sized too), charcoal		↓				
↓	1.3			↓	Loose	Bright Red	clinkers, furnace slag)						
↑				Silt-Sand Grav Mix	↓	↓	SILTY SAND-SOME GRAVEL	SM-GM	Fill; wet (fines)				
S-4							(f-c sand, well graded,		- No burned material visible				
↓	2						fines, f+c, subang. gravel to 1")						
↑				Silt-Sand less gravel	Denser	Lt Red-Brn	SILT-SOME SAND-TR GRAVEL	SM	Fill; wet (fines)				
S-5	2.2				↓	↓	(Mostly fines, f-c sand,		Fines slightly				
↓							well graded, f. subang. gravel to 1/2")		plastic; no burned material visible				
				EOB @ ~2.2'									
							Refusal @ 2.2' w/ hand auger						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Observed burned material in the soils from the 0.9-1.3' interval - few pieces of charcoal clinkers.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-3
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Grass surface)	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole	Driller BZ
↑				Topsoil + Root Mat	Loose	Dk Brn	SAND - SOME SILT - SOME	SP-SM	Topsoil; fill				
							ORGANICS - SOME GRAVEL		- No burned				
S1							(Mostly f-med sand, poorly		material observed				
							graded, fines, f. subrnd +						
							subang. gravel to ½",						
↓	0.3						glass shards, organic						
							roots/grass).						
↑				Sand-Grav Silt Mix w/ burned material	Loose	Tan Brn	SAND & GRAVEL - SOME	SM-GM	FILL				
							SILT - SOME BURNED MAT.	FILL	- Burned material				
S-2							(f-c sand, well graded,		mixed w/soil				
							f+c subang + subrnd		(few pieces)				
							gravel to 1", charcoal						
↓	0.6						clinkers)						
↑					Loose	DK brown			- Fill				
							- Similar to above		- Change in coloration				
S3							w/ 1-2 pieces of		- Burned material				
							charcoal clinkers		mixed w/ soil				
↓	1						observed		(few pieces)				
				EOB @ 1'			Refusal @ 1' - rock?						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. Burned material mixed w/ soil observed 0.3-1' bgs - few pieces of clinkers in each interval.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-4
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-PIH)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0	N/A	N/A				Grass surface						
↑				Topsoil + Root Mat	Loose	Dk Brn	SILTY SAND - SOME ORGANICS	SM	Topsoil; damp				
S-1					↓	↓	(Mostly f-m sand, poorly graded, fines, organic	↓	- No burned material observed				
↓	0.3				↓	↓	roots, grass)	↓					
↑				Sand + Gravel w/fines	Loose	Tan Brn	SAND & GRAVEL - SOME SILT	SM-GM	- Fill; damp				
S-2					↓	↓	(f-c sand, well graded,	↓	- No burned mat. observed				
↓	0.7				↓	↓	f+c subang. + subrnd. gravel to 1")	↓					
↑					Loose	Dk brn		↓	- Fill; damp				
S-3					↓	↓	- similar to above	↓	- No burned mat. observed				
↓	1			↓	↓	↓	w/ darker coloration	↓					
↑				Silt-Sand-Gravel Mix (more fines)	Loose	Red Brn	SILTY SAND - SOME GRAVEL	SM-GM					
					↓	↓	(Mostly f-c sand, well	↓	- Fill; damp				
S-4							graded, fines (clay-		- No burned material observed				
							sized too), f+c subang.						
↓	1.4				↓	↓	gravel to 1")	↓					
				EOB@ ~1.4'									
							EOB@ ~1.4' - Refusal						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed.
No burned material observed

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-5
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Drill BZ
	0	N/A	N/A				Grass surface	SM					
S-1	0.4			Topsoil + Root Mat	Loose	DK brown	SILTY SAND - SOME ORGANICS - TR. GRAVEL (Mostly f-m sand, poorly graded, fines, f-c subang. + subrnd. gravel to 1")		Topsoil; fill; damp - No burned material observed - Grass/roots present				
S-2	0.8			Burned Mat. Mixed w/ sand-grav. mix	Loose	Tan brn	SAND & GRAVEL - SOME SILT - SOME BURNED MATERIAL (f-c sand, well graded, f-c subang. + subrnd. gravel to 1.25", fines, ~3-5 pieces of charcoal clinkers)	SW-GW	Fill; damp - Few pieces burned material observed - mixed w/ soil				
S-3	1.4			Sand-Grav. Mix but no burned mat.	Loose	Red brn	- Similar material to above interval - Change in color observed		- NO BURNED MATERIAL observed in lower interval - Fill; damp				
							EOB @ ~1.4' - refusal						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material observed 0.4'-0.8' bgs - mixed w/ soil (few pieces of charcoal clinkers)

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-6
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-Pitt)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sample BZ	Borehole**	Driller BZ**
	0	N/A	N/A				Grass surface						
				Topsoil + Root Mat	Loose	DK Brn	SAND- SOME ORGANICS - TR. GRAVEL	SP	Topsoil; fill; damp				
S-1							Mostly f-med sand, poorly graded, fine subrnd gravel to ½", coarse subang. gravel to 1.25", organic roots, grass		- No burned mat. observed				
	0.4			Mostly sand interval									
S-2				- burn mat. near bottom			Similar to above material; fewer roots; 4-8 pieces of black charcoal clinkers + furnace slag near bottom	SP/Fill	- Fill; damp - Burned mat. observed - mixed w/soil (dkbrn). 1 clinker >1" diameter				
	1.4			EOB @ ~1.4'			EOB @ ~1.4' - refusal						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks: No cultural artifacts observed. Burned material (few pieces) observed near bottom of hole - mixed w/soil. Uniform soil.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-7
DATE: 4-26-04
GEOLOGIST: K Jalkut
DRILLER: S. Anderson (TENUS-PIH)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification (Grass surface)	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole**	Drill BZ**
	0	N/A	N/A										
S-1				Topsoil + Root Mat	Loose	DK brn	SILTY SAND - SOME ORGANICS. TR. GRAVEL (Mostly f-med sand, poorly graded, fines, organic roots, grass, f. subang + sub rnd gravel to 1/2")	SM	Topsoil; damp; fill - No burned mat. observed				
S-2	0.4			Sand Grav Mix, some fines	Loose	Tan Brn	SAND & GRAVEL - SOME SILT (f-c sand, well graded, f+c subang + subrnd gravel to 1.5")	SW-GW	- Fill; damp - No burned mat. observed				
S-3	0.8			More fines, less gravel w/ sand	Loose	DK Brn	SILTY SAND - SOME GRAVEL (f-c sand, well graded, fines, f. subrnd grav. to 1/2")	SM to GM	Fill; damp - No burned mat. observed				
S-4	1.1				Loose	Lt Red Brn	SILTY SAND - SOME GRAVEL - similar to material above w/ both subrnd + subang. f. gravel to 1/2"		Fill; damp - No burned mat. observed				
	1.4			EOB @ ~1.4'			Refusal @ ~1.4' EOB						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: No cultural artifacts observed. No burned material observed.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: PNS-Site 34
PROJECT NUMBER: 4089
DRILLING COMPANY: N/A
DRILLING RIG: N/A Hand Auger

BORING No.: 34-HA-8
DATE: 4-26-04
GEOLOGIST: K. Jalkut
DRILLER: S. Anderson (TENUS-PIH)

Sample No. and Type or RQD	EST. Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistancy or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sample BZ	Borehole**	Driller BZ**
	0	N/A	N/A				Grass surface						
S-1	0.4			Topsoil + Root Mat	Loose	DK brn	SILTY SAND - SOME ORGANICS - TR. GRAVEL (Mostly f-med sand, poorly graded, fines, roots, grass, f. gravel to 1/4")	SM	Topsoil; fill; damp				
S-2	0.8			Sand-Grav. Mix w/o burned mat.	Loose	Tan brn	SAND & GRAVEL - SOME SILT (f-c sand, well graded, f+c subang + subrnd gravel to 1")	SW-GW	Fill; damp - No burned Material observed				
S-3	1			Sand-Grav. Mix w/ tr. burned mat.		DK brn	SAND & GRAVEL - SOME SILT - TR BURNED MAT. (Similar to material above (dk coloration though) w/ few pieces of black charcoal clinkers)		Fill; damp - Few pieces burned material mixed w/ soil				
S-4	1.4			Silty Sand	Loose	Red brn	SILTY SAND - TR GRAVEL (F-C sand, well graded, fines (clay-sized too), f. subang. gravel to 1/2")	SM	Fill; damp - No burned Material observed				
				EOB @ ~1.4'			Refusal @ ~1.4'						

14 4-26

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: No cultural artifacts observed.
Burned material observed 0.8'-1' interval - pieces (few) mixed w/ soil

Drilling Area Background (ppm):

Converted to Well: Yes _____ No X Well I.D. #: _____

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-01
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD Time	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				loose	brown	dry silty sand		top 6" topsoil				
	1		19/24	14" color Δ dk brn 24" color Δ tan		dk brown	same, some coal chips		sample 0-2 ft				
1402	2						<¼" over 2-3" interval @ 14"		OU9-SS-01-0002 PAH/metals				
	3		20/24		mod compact	tan	dry silty sand, some		sample 2-4 ft				
1409	4						friable SS gravel 32-36"		OU9-SS-01-0204 PAH/metals				
	5		–						refusal 4.5 ft (1)				
							EOB 4.5 ft		refusal 3'10" (2)				
							last 0.5 ft was slough,						
							not used in sample.						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): –

Remarks: (1) 4-4.5 ft was sloughing - not used in sample
(2) second attempt
2-Boot liners

Converted to Well: Yes _____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-02
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD Time	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				loose	lt brn	coarse-fine sand		top 6" topsoil				
1415	1		20/24	↓ Increasing silt			with gravel to 1.5"		sample 0-2ft				
	2						and silt		OU9-SS-02-0002 PAH/metals				
									Attempt 1 refusal 2.0ft				
							EOB 2.0 ft		Attempt 2 refusal 2.0ft				
									Attempt 3 refusal 2.0ft				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: 2-foot liners
MS/MSD on OU9-SS-02-0002

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: 009 Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: 009-03
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD (Time)	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0			Color change brown - tan	loose	brown	silty sand, dry		top 6" topsoil				
	1		22/24				increasing gravel		sample 0-2ft				
1350	2					tan	to 1" with depth		002-SS-03-0002 PAH/metals				
									refusal @ 2.0ft				
							EOB 2.0ft		3 attempts				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: 2-foot liners

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: 009-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: 0119-04
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD / Time	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				loose	brown	sandy soil w/ silt and 15 gravel to 1"		top 6" topsoil				
	1		22/24				@ 6" - black plastic (bag?)		sample 0-2 ft				
1335	2						15-18" black ash layer with coal chips to <1/4"		009-SS-04-0002 PAH/metals				
	3		24/24		mod compact	tan	sandy silt, slmoist w/15 gravel to 2"						
	4								sample 2-5 ft				
1338	5		18/24				@ 5 ft - vy thin, <1/2" layer of ash/coal chips		009-SB-04-0205 PAH/metals				
	6												
	7		12/24				@ 7ft - 3" layer of ash/ coal mixed w/sandy silt		sample 5-8 ft				
1340	8				compact	gray tan	15 gravel & fine/med sand 7.3 ft bgs to EOB		009-SB-04-0508 PAH/metals				
							EOB 8.0 ft						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: 2-foot liners

~~Duplicate on 009-SB-04-0508 (FD0824090 1)~~

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: S4-DT Geoprobe

BORING No.: OU9-05A
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD / Time	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				loose	lt brn	fine silty sand /		fill material				
	1						sandy silt with		from stormwater				
1421	2						some lt gravel		drain				
	3								no samples.				
	4						same						
1424	5												
	6												
	7						same						
1429	8						EOB						
					* Boring was moved 4 feet north								
					b/c of utilities (SW drain)								
						used 2-foot liners							

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): –

Remarks: Consistent material from top to EOB. Appears to be fill compared to other borings and location of SW drain. No samples collected per direction from PM.

Converted to Well: Yes _____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: 009-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: 009-05-B
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD Time	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				mod compact	brown	sandy silt with		top 6" topsoil				
	1		20/24				pebbles, some clay,		sample 0-2 ft				
1435	2						sl. moist - till?		009-SB-05-0002 PAH/metals				
	3		16/24										
	4						same		sample 2-5 ft				
1440	5		18/24						009-SB-05-0205 PAH/metals				
	6		10/12				same		sample 5-7 ft				
1444	7								009-SB-05-0507 PAH/metals				
							EOB 7.0 ft		Attempt 1 refusal 7.0 ft				
									Attempt 2 refusal 6.0 ft				
							Coordinates:						
							MF SP W (ft)						
							NAD 83						
							N: 92029.73						
							E: 2779781.85						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: Began raining on 1st attempt. 2nd attempt occurred after rain stopped. 2 foot liners

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: 009-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: 009-06
DATE: 08/24/09
GEOLOGIST: S. Warnno
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		24/24	darker and more compact with depth	loose	lt brn	dry sandy silt,		top 6" topsoil				
	1						angular 1s gravel		sample 0-2 ft				
1315	2					dk brn	to 2"		009-SS-06-0002 PAH/metals				
	3		20/24										
	4								sample 2-5 ft				
1319	5		22/24						009-SB-06-0205 PAH/metals				
	6				mod compact		same, sl. moist						
	7		18/24						sample 5-8 ft				
1324	8								009-SB-06-0508 PAH/metals				
							EOB 8 ft						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: 2-foot liners

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112GD14156
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-0~~8~~7
DATE: 08/25/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				–	gry	concrete & base rock		6 inch thick	0	0	0	
	1		12/48		loose	lt brn	sand base underlain		dry				
	2						by gravel to 1.5 ft			0	0		
	3												
	4												
	5		6/48		loose	gry brn	gravely sand (construction base)		dry	0	0		
	6			abrupt lith Δ @ 8 ft bgs									
	7				dense	brn/orange	~5 inches of sandy		possible native soil	0	0		
	8						silt, w/some mica flecks						
	9		48/48				rounded and angular						
	10						gravel to 1/2" @ 7.5 ft bgs			0	0		
	11												
	12		48/48							0	0		
	13												
	14												
	15		35/36		dense		same as above			0	0		
	16						some moisture 16 feet						
	17								refusal 17 feet	0	0		
							EOB 17 ft						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: 4-foot liners; no samples collected.

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: OU9 Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-08
DATE: 08/25/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				dense	gray	concrete 4" thick			NA	NA	6.0	
	1												
	2		4/48										
	3												
	4												
	5						no recovery			NA	NA		
	6		0/48										
	7												
	8												
	9		3/12		mod. compact	blk	gravel to ~½" (fall-in) and clayey sandy silt (~2") ~~strong odor, some~~ sheen. Clayey sandy silt ~~was moderately~~ compact		refusal @ 9.0 ft (brick) tried pushing through no progress. 3 attempts.	6.2	0.0		
	10												
	11												
							EOB 9 ft						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: 4-foot liners

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9 - Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-09
DATE: 8/25/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				dense	gray	concrete, 6" thick				0.0	7.2	
	1												
	2		0/1/8										
	3						wood, dry, unstained		refusal 3.5 feet				
	4						attempt to push						
	5						through timber for						
							~45 minutes.		no soil				
							Some slight give,		recovered				
							but final refusal						
							@ 4.5 feet						
							EOB 4.5 feet						
							no sample collected						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks:

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: 009 - Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: S4-DT Geoprobe

BORING No.: 009-10
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				mod dense	brown tan	silty sand with ls		topsoil top 6"				
	1		24/24				gravel to 2", dry		(1) sample 0.5-2 ft 009-SB-10-0002 PAH/metals				
1527	2						some wood pieces (hardwood to 3")						
	3		6/24										
1530	4												
	5		8/24										
1537	6				mod dense	brown	sandy silt, some angular ls gravel to ½" (slough?)		sample 6-8 ft (2) 009-SB-10-0008 PAH/metals				
	7		13/24										
1540	8												
							EOB 8 ft						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: 2" liners (1) fill sample (2) native soil sample
Native starts @ ~6 ft bgs

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: S4-DT Geoprobe

BORING No.: OU9-11
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				loose	tan	silty sand w/ 15		top 6" topsoil				
	1		24/24				gravel to ½", moist		sample 0-2 ft OU9-SS-11-0002 PAH/metals				
1450	2				mod dense	brown	sandy silt, rounded and angular gravel to 1 inch..						
	3		19/24	Gradational					(1) sample 2-6 ft (2) OU9-SB-11-0206 PAH/metals				
1454	4												
	5		21/24										
1458	6			6.5ft	friable	black	friable organic layer to 7.0 ft (decomposed organic woody matter)						
	7		15/24										
1500	8				stiff dense	brown	silty clay, some gravel to ¼"						
							Coordinates:						
							MESPW (ft)						
							NAD 83						
							N: 92015.18						
							E: 299753.75						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: moved location b/c of utilities - core collected during & after rain shower (2) Duplicate of OU9-SB-11-0206 (FD082409 03) (1) native @ 2 feet

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-12
DATE: 08/24/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0		18/24	4.5ft	loose	brown tan	silty sand w/gravel to 1.5 feet		moist topsoil to 6"				
	1								sample 0.5-2ft OU9-SS-12-0002 PAH/metals				
1508	2												
	3		24/24						sample 2-4.5ft OU9-SB-12-0204 PAH/metals				
1511	4				mod dense	brn	silty clay w/gravel to ~½", moist						
	5		24/24						sample 4.5-6ft OU9-SB-12-0406 PAH/metals				
1514	6				mod dense	brn	silty sand, fine-med grained, moist						
	7		19/24						sample 6-8ft OU9-SB-12-0608 PAH/metals				
1520	8												
							EOB 8 ft						
							Duplicate sample of OU9-SS-12-0002 (FD082409002) ↳ duplicate fill sample.						
							coordinates: MESPN (ft) NAD 83 N: 92005.95 E: 279721.98						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: added boring for additional fill/native soil pair
boring completed after rain shower

Converted to Well: Yes _____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: 009- Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: 009-13
DATE: 08/24/09
GEOLOGIST: S. Wanno
DRILLER: M. Gleason

Sample No. and Type or RQD Time	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0					brown	silty sand, 2"-chunk		top 6" topsoil				
	1		16/24				of native rock (granite						
1550	2						w/muscovite)						
	3		6/24										
1555	4		24			dk brn	same, some angular SS (1.5')		sampled 4-6ft				
	5		24/24	increasing clay content			gravely sandy clay moist		009-SB-13-0406 PAH/metals				
1610	6						thin coal layer (<1 inch) at 5.4ft)		sampled 6-8ft				
	7		24/24			tan	clay to 6.7ft, then 0.7		009-SB-13-0608 PAH/metals.				
1615	8					black	feet of fine crumbly black						
							coal/ash, vy strong odor						
						dk brn	coal chunks to 1", layer						
							becomes finer grained with						
							depth, and grades to						
							dk brn silty clay (cohesive)						
							to EOB @ 8 ft.						
							coordinates:						
							ME SP W (ft)						
							NAD 83						
							N: 92022.95						
							E: 2799654.33						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks:

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9 - Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TNS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-~~1~~14 SW
DATE: 08/25/09
GEOLOGIST: J. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				dense	brn	topsoil ~ top 6"						
	1		1.2/2				granite pieces, silty sand, dry						
1012	2												
	3		1.0/2		loose	brn	gravel to 2", silty sand, dry		sample 4-6 ft OU9-SB-14-0406 PAHs only - volume				
1015	4												
	5		0.5/2						sample 6-8 ft OU9-SB-14-0608 PAHs/metals				
1020	6												
	7		2/2	6ft Δ to sandy silt	dense	tan	silty sand, moist		coal pieces 6-6.2ft				
1022	8								sample 8-10 ft OU9-SB-14-0810 PAH/metals				
	9		1.75/2				same, coal pieces increase from 8-8.25 ft						
1025	10												
							coordinates: ME SP W(ft) NAD 83						
							N: 92023.82						
							E: 2799660.06						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): —

Remarks: 5 feet east of OU9-14

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

PROJECT NAME: OU9-Site 34 RI
PROJECT NUMBER: 112G01456
DRILLING COMPANY: TDS
DRILLING RIG: 54-DT Geoprobe

BORING No.: OU9-~~X~~SW15
DATE: 08/25/09
GEOLOGIST: S. Warino
DRILLER: M. Gleason

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length ft/ft	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0				dense	brn	topsoil, silty sand						
	1		2/2				contains coal pieces from		1-2 ft, some brick				
1035	2												
	3		.4/2		loose	gry/brn	gravel & sand, some		small coal pieces (<¼")				
1038	4						may be sloughing		sample 4-6 ft OU9-SB-15-0406 PAH only - volume				
	5		.6/2						sample 6-8 ft OU9-SB-15-0608 metals & PAHs				
1050	6												
	7		1.3/2		mod compact	brn/blk	silty sand w/coal pieces,		strong odor				
1052	8								sample 8-10 ft OU9-SB-15-0810 metals & PAHs				
	9		2/2		compact	brn	silty sand, grades from						
1054	10						dk brn to med brn						
	11						~~at~~ EOB		Refusal 10.5				
							EOB @ 10.5 ft						
							coordinates:						
							ME SPW (ft)						
							NAD 83						
							N: 92021.92						
							E: 2799648.29						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): [ ]

Remarks: 5 feet west of OU9-13

Converted to Well: Yes ____ No X Well I.D. #: NA

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEOPROBE

BORING No.: OU9-16
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
						GRY	GRAVEL ASPHALT	GW	ASPHALT SURFACE	19	0		0
S11	2		2/2		LOOSE	BRN	SAND + GRA TR SILT	GW/SW	MOIST TO DRY	25	0		0
					LOOSE	MED BRN	SAND TR SILT	SW	COLLECTED SPL 0-2'	55	0		0
S-2	4		1/2				(FILL?)		0095S160002				
S-3						MED BRN	f-g SAND w/	SW	MOIST	0			
	6		2				SOME SILT TR GRAVELL		0095B160205				
S-4					DENSE		GRAVEL w/ SAND	GW	ROCK FRAG	0			
	8		2						ROCK FLOUR 0508	0			
							REFUSAL @ 8'						
	10												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: GEOPROBE GC DT

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEOPROBE DT60

BORING No.: OU9-17
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1							ASPHALT GRAVEL	GW					
	2		2/2			LGT BRN	GRAVEL	4					
						ORG BRN	SILT, GRAVEL	GW/SW	SAND MIX MOIST/DRY	0	0		
S-2					MED DENSE	MED BRN	GRAVEL W/ SOME	GW	COLLECTED (SPL 0-2 FOR LAB)				
	4		1.5/2				SAND, SILT	SW		0			
S-3													
	6		1/2							0			
S-4					DENSE		GRAVEL & SAND	GW	DRY				
	8		1.5/2				WEATHERED BDRK 6" INTO ROCK			0			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: 2" MACRO CORE W/ PLASTIC SLEEVES

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEOPROB PTCO

BORING No.: OU9-18
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1							GRAVEL	GW	ASPHALT				
	2		1/2			BLK	SAND/GRAVEL/SILT	SW/GW	DAMP	0			
S-2					LOOSE	BLK	AS ABOVE		DAMP				
	4		1/2							0			
S-3						BLK	SILTY f-g SAND	SW					
	6		2/2		LOOSE	BRN	SILTY f-g SAND		WET TRCGR.	0			
S-4					MED DENSE	BRN	GRAVEL	GW	ROCK FRAG.				
	8		1.5/2		DENSE		TOP OF ROCK @ 7.5'			0			
							REFUSAL @ 8'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0.0

Remarks: MACRO CORE 2" x 2'

Converted to Well: Yes _____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: DT 60 GEOPROBE

BORING No.: OU9-19
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY TDS

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1						LT. YEL BRN	SAND BY LOAM	SP					
	2		1.5/2		LOOSE	DK BRN	SAND + SILT	SW	GLASS FRAGS TERRA COTTA	0			
S-2							GRAVEL	GW	FILL				
	4		1/2				ROCK FRAGS		POOR REC.	0			
S-3							GRAVEL + SAND	GW/SW					
	6		1.5/2			MED BRN	f-g SAND TR SILT	SW	TR GRAVEL LOOK NATL.	0			
S-4													
	8		2/2			LGT YEL BRN	SAND AND GRAVEL	GW/SW	MOIST LOOK LIKE STRONGLY WEATHERED BED ROCK	0			
				TD									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): ____

Remarks: 2" MACRO-CORE x 2'

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEOPROBE

BORING No.: OU9-20
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1						LT BRN	SANDY LOAM W/GRAVELS	SM/GW					
	2		2/2		LOOSE		↓			0			
S-2							SAND + GRAVEL	GW	TERRA COTTA FRAGS (FILL) MOIST				
	4		2/2			BLK	SAND + GRAVEL			0			
S-3							AS ABOVE		POOR REC.				
	6		1.0/2					↓		0			
S-4					↓	YELL BRN	SAND (F-g) AND GRAVEL	SM/GW	SLIGHTLY MOTTLED	0			
	8		2/2				↓ TR SILT						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" MACRO-CORE X 2'

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEOPROBE DT60

BORING No.: OU9-21
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MAT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S1						YEL BRN	SANDY LOAM	SW	DRY				
	2		2/2		LOOSE		GRAVELS	SW/GW		0			
S2						MED BRN TO YEL BRN	SAND (f-c)	SW					
	4		2/2				TR GRAVELS			0			
S3						"	SAND + GRAVEL	SW/GW					
	6		1/2							0			
S4							AS ABOVE			0			
	8		40/2		HARD		SAND + GRAVEL - ROCK FRAGS	GW	DRY				
							- WEATHERED BR. ROCK						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: 2" MACRO CORE X 2'

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEO PROBE DT 60

BORING No.: OU9-22
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1						YEL BRN	SANDY GRA MEDBRN		TR GRAVS				
	2		2/2				DK BRN	SW	BLK @ 1.8'	0		0	
S-2					LOOSE		VERIEGATED SAND	SW	SLAG PEBBLES				
	4		1/2				+GRA. YEL BRN BRN SAND		REDDISH PEBBLES NOT TERRA COTTA				
S-3							AS ABOVE	SW		20		0	
	6		1/2		MED LOOSE		(SLAG MORE ABUNDANT) -GLASS FRACS						
S-4							+ SLAG BLACK (6") CHARRED TERRA COTTA		-CHARRED ROCK FRAC-S GLASS	40	0	0	0
	8		1/2				GRAVELS TRACE SAND + SIL		TAR (?) PEBBLES LIKE SUBSTANCE ODEROUS	50			
				TD 8'									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" MACRO CORE X 2'

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEO PROBE DT 60

BORING No.: OU9-23
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1						MED BRN SAND + GRA.							
	2		2/2		LOOSE		↓			0			
S-2					↓	LGT BRN	SAND + GRAVEL						
	4		2/2			LGT BRN	SAND + GRAVEL		DRY WEATHERED ROCK	0			
									REFUSAL	0			
	6								@ 4'				
	8						- SEVERAL						
							ATTEMPTS						
							RESULTED IN						
							REFUSAL						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" MACRO CORE x 2'

Drilling Area Background (ppm): ____

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEOPROBE DT60

BORING No.: OU9-24
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
						MED BRN SAND MED BRN GRA. + SILT			(LOAM) 6" TOP	0			
	2		2/2		LOOSE	DK BRN SAND + GRAVEL		GW	TR SLAG GRA SLATE (FILL)	0			
						DK BRN SAND + GRA.		GW	MOIST TO WET	0			
	4		1.5/2			MED BRN LT BRN	V. WEATHERED BDRK GRAVEL			0			
				11.6	DENSE HARD		BDRK	GW	REFUSAL @ 4.5' BGS				
	6												
							-SEVERAL						
							ATTEMPTS						
							RESULT IN						
							REFUSAL						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: 2" x 2' MACRO CORE SPL DPT

Drilling Area Background (ppm): 0

Converted to Well: Yes ____ No X Well I.D. #: ____

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

PROJECT NAME: PNS Site 34
PROJECT NUMBER: 112G01456 CTO 533
DRILLING COMPANY: Tech Drilling Services
DRILLING RIG: GEO PROBE

BORING No.: OU9-25
DATE: 9-14-10
GEOLOGIST: Fred W. Ramser
DRILLER: MATT KELLY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
S-1					DK	GREY GRE-1	ASPHALT - GRAVEL SUBBASE GRAVEL		ASPHALT SURFACE				
	2		2/2			LT ORG	GREY GRAVEL + SAND BRN SAND + SILT	GW/SW	DRY	0			
S-2					LOOSE	BRN	SAND + GRAVEL	GW		0			
	4		1/2										
S-3										0			
	6		1/2			LGT	BRN SAND + GRA.	GW/SP	DRY				
S-4						ORG	BRN SAND	SP	MOIST	0			
	8		2/2				TR GRAVEL		LOOKS NATIVE				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: MACRO CORE 2" x 2'

Drilling Area Background (ppm): 0.0

Converted to Well: Yes ____ No — Well I.D. #: —

A.3 CONCENTRATION CROSS-SECTION FIGURE

Contaminant Concentration Cross Section A - A'

A

Excavated Area

Well ID	OU9-24					OU9-23					OU9-10				
Elevation	0-4.5 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-4 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
118															
117.5															
117															
116.5															
116															
115.5															
115															
114.5															
114															
113.5															
113	Loam														
112.5	Sand, gravel, and silt. Trace slag	1000	2.3 J	503 J	0.5						Topsoil top 6".	540	0.57 J	29.9 J	0.021
112						Sand and gravel	470	0.48 J	106 J	0.2	Silty sand with gravel, some wood pieces.				
111.5															
111	Sand and gravel	4	0.35 UJ	7.8 J	0.012 J										
110.5															
110							6	0.46 UJ	6.5 J	0.0085 J					
109.5	Very weathered bedrock, gravel														
109															
108.5						weathered bedrock									
108															
107.5															
107															
106.5											Sandy silt, some gravel.	32	0.6 J	31.2 J	0.013
106															
105.5															
105															
104.5															
104															
103.5															
103															
102.5															
102															

Well ID	OU9-15					OU9-22					OU9-13					OU9-14				
Elevation	0-10.5	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-10 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
118																				
117.5																				
117																				
116.5																				
116																				
115.5																				
115																				
114.5																				
114																				
113.5																				
113																				
112.5																				
112	Topsoil, silty sand, contains coal pieces from 1-2 ft, some brick.					Sand and gravel	6100	0.325 J	24.85 J	0.09 J	Topsoil top 6"					Topsoil top 6"				
111.5																				
111																Granite pieces, silty sand.				
110.5																				
110											Silty sand.									
109.5																				
109	Gravel and sand, some small coal pieces.					Sand and gravel. Slag pebbles and reddish pebbles	77000	0.77 J	267 J	8.2										
108.5																				
108																Gravel, silty sand.				
107.5		14000	3	711	7.4															
107											Gravely sandy clay, thin coal layer (>1") at 5.4 ft	53000	3.7	804	3.5		1400	0.71 U	64.6	0.55
106.5						SAA, black slag more abundant, charred terra cotta, glass fragments	610000	0.31 UJ	118 J	0.8										
106																				
105.5	Silty sand with coal pieces.	12000	0.45 U	172	1.2						Clay to 6.7 ft, then 0.7 feet of blk coal/ash, grades to silty clay. EOB-8 feet.	230000	0.65 U	217	0.85	Silty sand. Coal pieces from 6-6.2 feet.	89	0.74 U	16.6	0.046
105						Gravels, trace sand and silt														
104.5																				
104																Some coal pieces (increase from 8-8.25 ft.				
103.5																				
103		3900	0.46 U	38.6	0.35												7000	0.63 U	101	0.22
102.5	Silty sand.																			
102																				

* Cross-section locations are shown on Figure 3-1.

Acronyms
EPC- Exposure Point Concentration
EOB- End Of Boring

Color Coding
Light Brown = 2007 remedial action fill material. Fill material was collected to calculate EPCs in excavation area.
Dark Gray-Ash observed in sample.
Light Gray-Burnt material observed in sample.

Contaminant Concentration Cross Section A - A'

Excavated Area | Unexcavated Area | Excavated Area | A'

Well ID	OU9-20					OU9-21					OU9-12					OU9-11					OU9-05					OU9-19				
Elevation	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-7 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
118	Sandy loam with gravels	260	0.34 UJ	36.1 J	0.027 J																									
117.5																										Sandy loam	4100	0.44 UJ	123 J	0.1
117	Sand and gravel, terra cotta fragments.																													
116.5																Topoil top 6"					Topsoil top 6"					Sand and silt. Glass & terra cotta frags				
116		6000	0.93 J	1050 J	0.62						Topoil top 6"					Silty sand with	3.8 U	0.15 UJ	20.5 J	0.011		110	0.32 J	23.2 J	0.027					
115.5												385	0.6 J	3697 J	0.0665															
115											Silty Sand with gravel to 1.5 feet.															Gravel, rock fragments and sand	54	0.34 UJ	42.2 J	0.069
114.5						Sandy loam	360	0.37 UJ	38.1 J	0.03 J																				
114												790	1.1 U	1180	0.062															
113.5						Gravel										Sandy silt with gravel	212.5	1.9 J	166 J	0.18	Sandy silt with pebbles, some clay.	8	0.24 J	12.7 J	0.11					
113											Silty clay with gravel.																			
112.5						Sand, trace gravels	99	0.29 UJ	45.2 J	0.063																				
112												140	0.72 U	138	0.044											Sand. Trace silt and gravel.	5	0.58 J	9.6 J	0.0096 J
111.5	Sand and gravel, trace silt																													
111		38	0.37 UJ	12.2 J	0.0048 J																	3.5 U	0.25 J	6.3 J	0.19					
110.5																										Sand and gravel, weathered bedrock				
110											Silty sand, fine to medium grained.					Organic layer to 7 ft														
109.5						Sand and gravel	12	0.31 UJ	15.1 J	0.0067 J		20	0.55 U	190	0.017	Silty clay, some gravel.														
109																														
108.5																														
108																														
107.5						Sand and gravel, weathered bedrock																								
107																														
106.5																														
106																														
105.5																														
105																														
104.5																														
104																														
103.5																														
103																														
102.5																														
102																														

* Cross-section locations are shown on Figure 3-1.

Acronyms
EPC- Exposure Point Concentration
EOB- End Of Boring

Color Coding
Light Brown = 2007 remedial action fill material. Fill material was collected to calculate EPCs in excavation area.
Dark Gray-Ash observed in sample.
Light Gray-Burnt material observed in sample.

Contaminant Concentration Cross Section C - C'

C — Excavated Area — C'

Well ID	OU9-25					OU9-17					OU9-16					OU9-18				
Elevation	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
119.5																Gravel	3400	2.1 J	494 J	1.1
119						Asphalt	16	0.43 UJ	18.8 J	0.049	Asphalt	32	0.27 UJ	22.1 J	0.73					
118.5						Gravel					Gravel					Sand, gravel, silt				
118						Silt and gravel					Sand and gravel, trace silt									
117.5																	210	0.32 UJ	550 J	0.4
117						Gravel, sand, and silt	3.5 U	0.695 J	13.55 J	0.0033 J	Sand, trace silt	3.8 U	0.44 UJ	5 J	0.005 J					
116.5	Asphalt	16	0.45 UJ	48.5 J	0.051															
116	Gravel subase																			
115.5	Gravel and sand															Silty sand				
115	Sand and silt										Sand with some silt, trace gravel									
114.5	Sand and gravel	3.6 U	0.38 UJ	4.8 J	0.0025 J															
114							3.5 J	0.87 J	10.8 J	0.025 U		3.5 U	0.32 UJ	2.4 J	0.021 U					
113.5																Gravel	3.8 U	3.05 UJ	8.05 J	0.0315 J
113						Gravel and sand					Gravel with sand									
112.5																				
112																Top of bedrock				
111.5		7	0.38 UJ	5.1 J	0.023 U	weathered bedrock														
111																				
110.5																				
110																				
109.5																				
109																				
108.5																				
108																				

* Cross-section locations are shown on Figure 3-1.

Acronyms
EPC- Exposure Point Concentration
EOB- End Of Boring

Color Coding
Light Brown = 2007 remedial action fill material. Fill material was collected to calculate EPCs in excavation area.
Dark Gray-Ash observed in sample.
Light Gray-Burnt material observed in sample.

Contaminant Concentration Cross Section F - F'

F — Unexcavated Area — F'

Well ID	OU9-01					OU9-02					OU9-03					OU9-04					OU9-06				
Elevation	0-4.5 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-2 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-2 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	0-8 ft	BAP equivalent (µg/kg)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
117																					Topsoil top 6"				
116.5																					Sandy silt, angular gravel.	140	0.41 J	60 J	0.022
116																Topsoil top 6"									
115.5											Topsoil top 6"					Sandy soil with silt and gravel. Some ash and coal chips.	230	0.49 J	191 J	0.19					
115											Silty sand, increasing gravel with depth.	330	0.77 J	457 J	0.65							350	0.37 J	108 J	0.0048 U
114.5						Topsoil top 6"																			
114						Coarse to fine sand with gravel and silt.	83	0.55 J	97.9 J	0.083															
113.5																									
113																Sandy silt with gravel. At 5 feet and 7 feet thin layer of ash/coal chips.	33	1.1 J	121 J	0.32					
112.5																									
112	Topsoil top 6"																								
111.5	Silty sand, some coal chips.	200	0.6 J	441 J	0.13																	120	0.36 J	51.2 J	0.093
111																	67	0.95 J	152 J	0.345					
110.5																									
110	Silty sand, some friable gravel.	5	0.22 J	35.6 J	0.031																				
109.5																									
109																									
108.5																Gravel and fine/med.									

* Cross-section locations are shown on Figure 3-1.

Acronyms
EPC- Exposure Point Concentration
EOB- End Of Boring

Color Coding
Light Brown = 2007 remedial action fill material. Fill material was collected to calculate EPCs in excavation area.
Dark Gray-Ash observed in sample.
Light Gray-Burnt material observed in sample.

A.4 PRE AND POST EXCAVATION AS-BUILT FIGURES

STRUCTURE TABLE

CB #48–1
RIM. ELEV.=110.4'

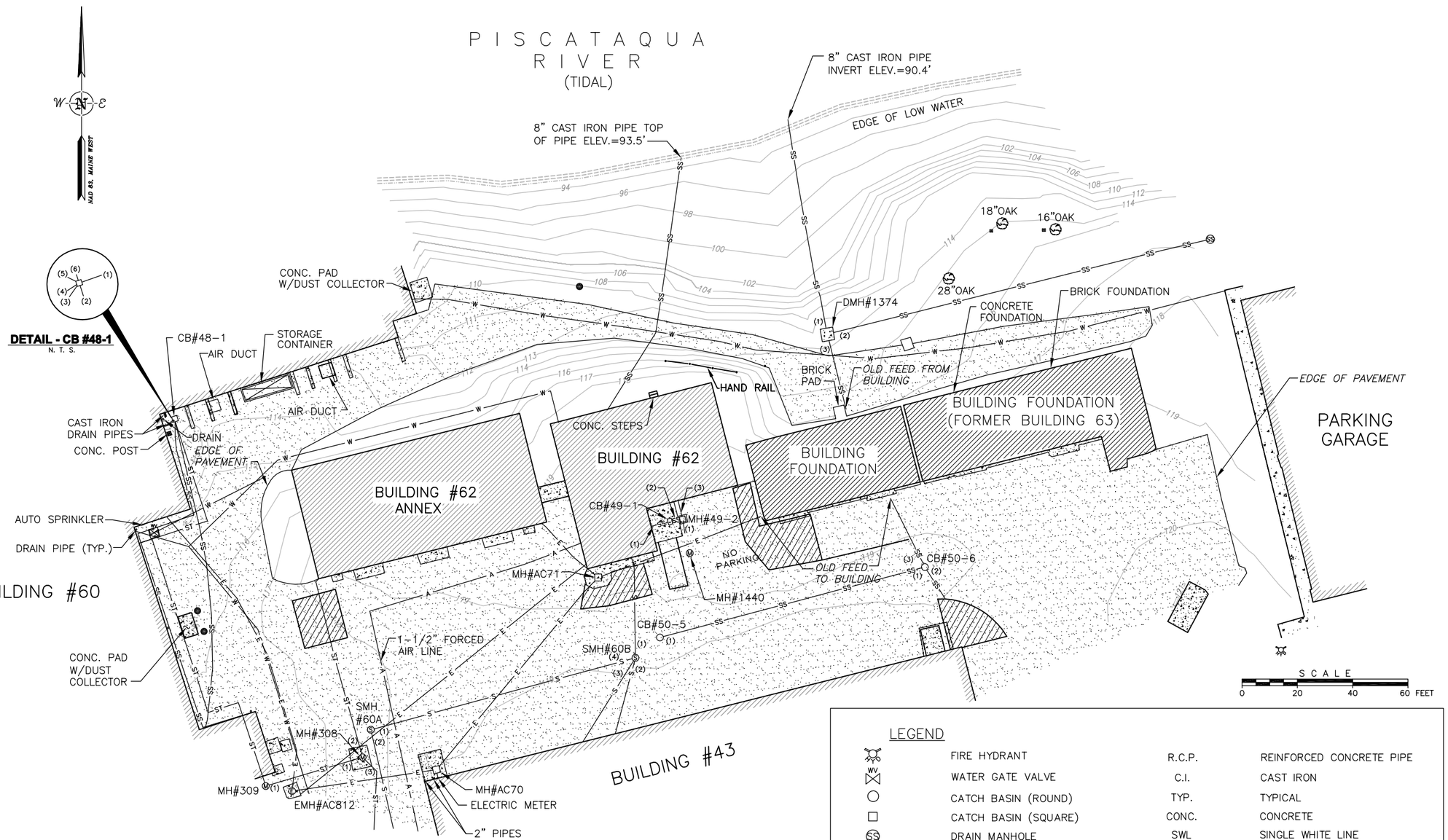
CB #49–1
RIM ELEV.=119.6'
(1) 4" C.I.=118.3'
(2) 6" C.I.=117.9'

MH #49–2
RIM ELEV.=119.5'
(1) 8" C.I.=115.6'
DESTINATION UNKNOWN
(2) 6" C.I.=116.0'
(3) 8" C.I.=115.6'

CB #50–5
RIM ELEV.=118.5'
(1) 8" C.I.=115.4'

CB #50–6
RIM. ELEV.=118.6'
(1) 8" C.I. ELEV.=114.0'
(2) 8" C.I. ELEV.=114.0'
(3) 12" C.I. ELEV.=114.0'

DMH #1374
RIM ELEV.=113.5'
(1) 24" C.I.=107.1'
(2) 18" R.C.P.=107.8'
(3) 12" C.I.=110.4'



DETAIL - CB #48-1
N. T. S.

LEGEND

	FIRE HYDRANT	R.C.P.	REINFORCED CONCRETE PIPE
	WATER GATE VALVE	C.I.	CAST IRON
	CATCH BASIN (ROUND)	TYP.	TYPICAL
	CATCH BASIN (SQUARE)	CONC.	CONCRETE
	DRAIN MANHOLE	SWL	SINGLE WHITE LINE
	ELECTRIC MANHOLE	SYL	SINGLE YELLOW LINE
	SEWER MANHOLE	100	EXISTING CONTOUR
	MANHOLE		HANDRAIL
	BOLLARD	S	SANITARY SEWER LINE
	DECIDUOUS TREE	SS	STORM DRAIN LINE
	CONCRETE PAD	ST	STEAM LINE
	PAVED AREA	A	FORCED AIR LINE
	STORAGE CONTAINER	W	WATER LINE
	NO PARKING ZONES	E	ELECTRIC LINE
			APPROXIMATE LOW WATER LINE

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS, TOPOGRAPHIC SURVEY , DATE: 12/12/07, SCALE: 1:20'
3. THE SURVEY ENTAILED THE SITE CONDITIONS DURING THREE DIFFERENT PHASES:

   PHASE 1 – "ORIGINAL EXISTING CONDITIONS" FIELDED ON 08/06/07 SHOWN ON PAGE 1 OF 7.

   PHASE 2 –"EXCAVATED SITE" FIELDED IN AUGUST, SEPTEMBER AND OCTOBERAS SHOWN ON PAGE 2 OF 7

   PHASE 3 – "AS–BUILT" FIELDED ON 11/09/07 AS SHOWN ON PAGE 3 OF 7
4. THE PLAN IS A COMPOSITE OF SURVEY DATA (TOPOGRAPHIC) PROVIDED BY NORTHEAST CIVIL SOLUTIONS AND SURVEY DATA PROVIDED BY THE CLIENT (UTILITIES AND THEIR CORRESPONDING UNDERGROUND LOCATIONS).

SYM	DESCRIPTION	DATE	APPR

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS: SHAW ENVIRONMENTAL 500 EAST MAIN STREET NORFOLK, VIRGINIA 23510
DSGN: J.H.K. DRWN: B.O.F CHK: P.S.V.
SUPV:
PRJMGR: F. POULIN CIV. STR.
MECH. ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN P.M. 2/6/08
(SIGNED) (TITLE) (DATE)

APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE (CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.–ARCH: /s/ SUPV. ENG.
SPV. ENG.–CIVIL: /s/ SUPV. ENG.
SPV. ENG.–ELEC: /s/ SUPV. ENG.
SPV. ENG.–MECH: /s/ SUPV. ENG.
CI – PM & E: /s/ CI – PM & E
APPROVED:
/s/ FEAD
FEAD PWD–ME DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
~ NAVAL FACILITIES ENGINEERING COMMAND ~
NAVAL STATION – NORFOLK, VIRGINIA
PORTSMITH NAVAL SHIPYARD
KITTERY, ME
SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION
EXISTING SITE CONDITIONS

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO–Number
SPEC. NO. 04–05–0050
CONSTR. CONTR. NO. N–62470–02–D–3260
NAVFAC DRAWING NO. 12513945
SHEET 2 OF 9
SHEET NO. C1 PW–ME DRAWING NO. RD–08–406

DRAWFORM REVISION: 11 APRIL 2007

UNCLASSIFIED

FILE NAME: G:\Project\LANTDIV\Portsmouth\125490\12549001.dwg LAYOUT NAME: C1 – Existing Site Conditions PLOTTED: Wednesday, July 16, 2008 – 6:18am

STRUCTURE TABLE

CB #48–1
RIM. ELEV.=110.4'

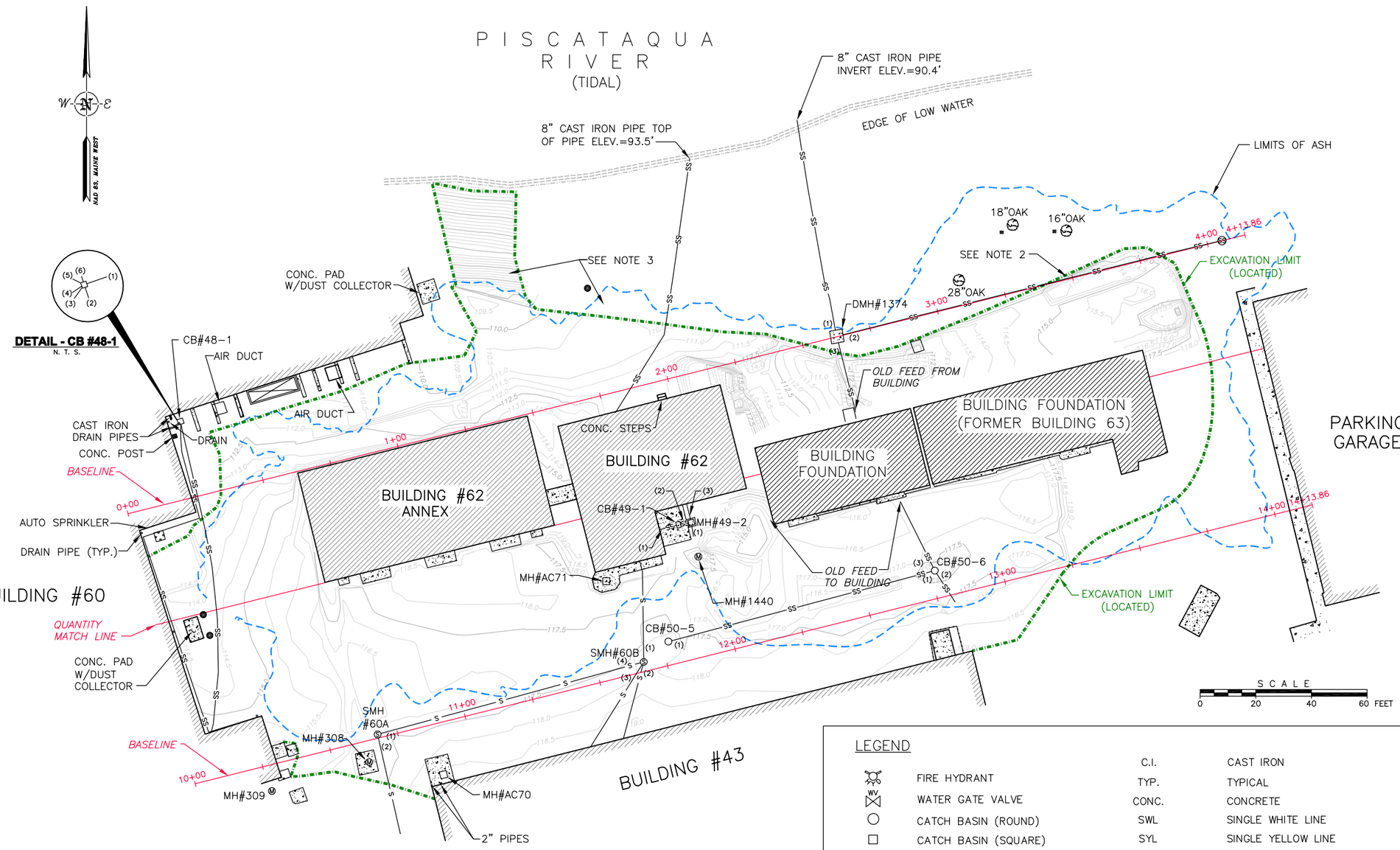
CB #49–1
RIM ELEV.=119.6'
(1) 4" C.I.=118.3'
(2) 6" C.I.=117.9'

MH #49–2
RIM ELEV.=119.5'
(1) 8" C.I.=115.6'
DESTINATION UNKNOWN
(2) 6" C.I.=116.0'
(3) 8" C.I.=115.6'

CB #50–5
RIM ELEV.=118.5'
(1) 8" C.I.=115.4'

CB #50–6
RIM. ELEV.=118.6'
(1) 8" C.I. ELEV.=114.0'
(2) 8" C.I. ELEV.=114.0'
(3) 12" C.I. ELEV.=114.0'

DMH #1374
RIM ELEV.=113.5'
(1) 24" C.I.=107.1'
(2) 18" R.C.P.=107.8'
(3) 12" C.I.=110.4'



DETAIL - CB #48-1
N. T. S.

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THE LIMIT OF EXCAVATION DOES NOT EXTEND TO THE LIMIT OF ASH IN ORDER TO PROTECT THE TREES.
3. AREA WAS EXCAVATED AS A PART OF SHORELINE STABILIZATION.
4. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS, TOPOGRAPHIC SURVEY , DATE: 12/12/07, SCALE: 1:20'
5. THE SURVEY ENTAILED THE SITE CONDITIONS DURING THREE DIFFERENT PHASES:

   PHASE 1 – "ORIGINAL EXISTING CONDITIONS" FIELDED ON 08/06/07 SHOWN ON PAGE 1 OF 7.

   PHASE 2 – "EXCAVATED SITE" FIELDED IN AUGUST, SEPTEMBER AND OCTOBERAS SHOWN ON PAGE 2 OF 7

   PHASE 3 – "AS–BUILT" FIELDED ON 11/09/07 AS SHOWN ON PAGE 3 OF 7
6. THE PLAN IS A COMPOSITE OF SURVEY DATA (TOPOGRAPHIC) PROVIDED BY NORTHEAST CIVIL SOLUTIONS AND SURVEY DATA PROVIDED BY THE CLIENT (UTILITIES AND THEIR CORRESPONDING UNDERGROUND LOCATIONS).

LEGEND

	FIRE HYDRANT	C.I.	CAST IRON
WV	WATER GATE VALVE	TYP.	TYPICAL
	CATCH BASIN (ROUND)	CONC.	CONCRETE
	CATCH BASIN (SQUARE)	SWL	SINGLE WHITE LINE
SS	DRAIN MANHOLE	SYL	SINGLE YELLOW LINE
E	ELECTRIC MANHOLE	111.0	EXCAVATION CONTOUR
S	SEWER MANHOLE		HANDRAIL
M	MANHOLE	S	SANITARY SEWER LINE
	BOLLARD	SS	STORM DRAIN LINE
	DECIDUOUS TREE	ST	STEAM LINE
	CONCRETE PAD	A	FORCED AIR LINE
	PAVED AREA	W	WATER LINE
	STORAGE CONTAINER	E	ELECTRIC LINE
R.C.P.	REINFORCED CONCRETE PIPE		APPROXIMATE LOW WATER LINE
			LIMIT OF EXCAVATION AS LOCATED
			LIMITS OF ASH

DATE	APPR	DESCRIPTION	STM

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS: SHW ENVIRONMENTAL 500 EAST MAIN STREET NORFOLK, VIRGINIA 23510
DSGN: J.H.K. DRWN: B.D.F CHK: P.S.V.
SUPV:
PRJMGR: F. POULIN CIV. STR.
MECH. ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN (SIGNED) P.M. (TITLE) 2/6/08 (DATE)

APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.–ARCH: /s/ SUPV. ENG.
SPV. ENG.–CIVIL: /s/ SUPV. ENG.
SPV. ENG.–ELEC: /s/ SUPV. ENG.
SPV. ENG.–MECH: /s/ SUPV. ENG.
CI – PW & E: /s/ CI – PW & E
APPROVED:
/s/ FEAD
FEAD PWD–ME DATE

DEPARTMENT OF THE NAVY ~ NAVAL FACILITIES ENGINEERING COMMAND ~ NAVAL FACILITIES ENGINEERING COMMAND – NORFOLK, VIRGINIA
IPT NAVAL STATION – KITTERY, ME
PORTSMITH NAVAL SHIPYARD
SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION
EXCAVATION

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO–Number
SPEC. NO. 04–05–0050
CONSTR. CONTR. NO. N–62470–02–D–3260
NAVFAC DRAWING NO. 12513946
SHEET 3 OF 9
SHEET NO. C2
PW–ME DRAWING NO. RD–08–407

DRAWFORM REVISION: 11 APRIL 2007

FILE NAME: O:\Project\LANTDIV\Portsmouth\125490\125490\1.dwg LAYOUT NAME: C2 – Excavation PLOTTED: Wednesday, July 16, 2008 – 1:39pm

UNCLASSIFIED

STRUCTURE TABLE

CB #48–1
RIM. ELEV.=110.4'

CB #49–1
RIM ELEV.=119.6'
(1) 4" C.I.=118.3'
(2) 6" C.I.=117.9'

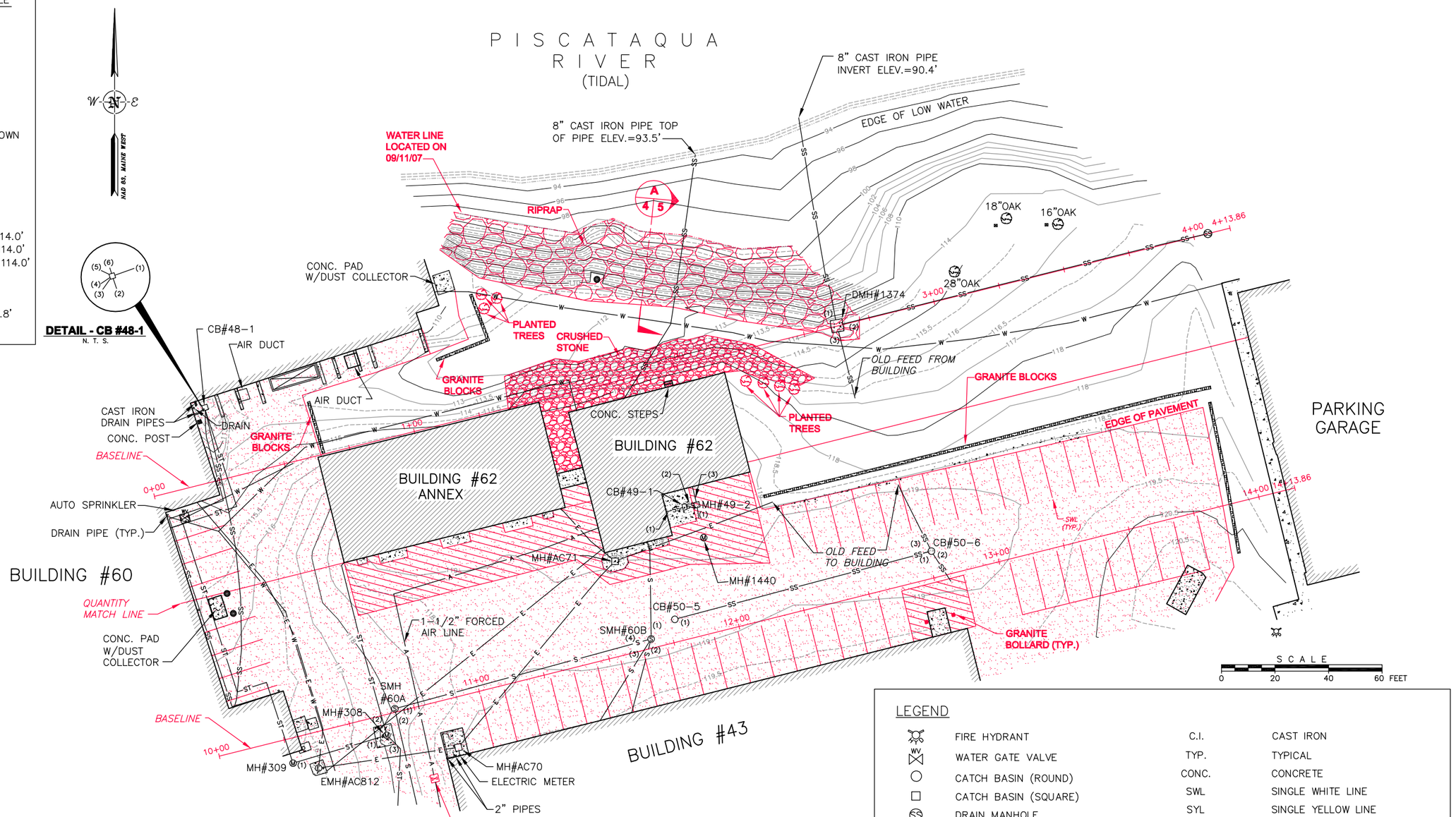
MH #49–2
RIM ELEV.=119.5'
(1) 8" C.I.=115.6'
DESTINATION UNKNOWN
(2) 6" C.I.=116.0'
(3) 8" C.I.=115.6'

CB #50–5
RIM ELEV.=118.5'
(1) 8" C.I.=115.4'

CB #50–6
RIM. ELEV.=118.6'
(1) 8" C.I. ELEV.=114.0'
(2) 8" C.I. ELEV.=114.0'
(3) 12" C.I. ELEV.=114.0'

DMH #1374
RIM ELEV.=113.5'
(1) 24" C.I.=107.1'
(2) 18" R.C.P.=107.8'
(3) 12" C.I.=110.4'

DETAIL - CB #48-1
N. T. S.



B 4 5 SHAW PROVIDED AND INSTALLED NEW HANDHOLE AND SHUTOFF VALVE AT THIS LOCATION (INSTALLED STAINLESS STEEL FULL PORT BALL VALVE WITH THREADED END, MANUFACTURED BY APOLLO VALVES.

LEGEND

	FIRE HYDRANT	C.I.	CAST IRON
WV	WATER GATE VALVE	TYP.	TYPICAL
	CATCH BASIN (ROUND)	CONC.	CONCRETE
	CATCH BASIN (SQUARE)	SWL	SINGLE WHITE LINE
SS	DRAIN MANHOLE	SYL	SINGLE YELLOW LINE
E	ELECTRIC MANHOLE	112	FINAL 1 FOOT CONTOUR
S	SEWER MANHOLE	112.5	FINAL HALF FOOT CONTOUR
M	MANHOLE		HANDRAIL
	BOLLARD	S	SANITARY SEWER LINE
	DECIDUOUS TREE	SS	STORM DRAIN LINE
		ST	STEAM LINE
	CONCRETE PAD	A	FORCED AIR LINE
	PAVED AREA	W	WATER LINE
	STORAGE CONTAINER	E	ELECTRIC LINE
	NO PARKING ZONES		APPROXIMATE LOW WATER LINE
R.C.P.	REINFORCED CONCRETE PIPE		GRANITE BLOCKS

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS, TOPOGRAPHIC SURVEY , DATE: 12/12/07, SCALE: 1:20'
3. THE SURVEY ENTAILED THE SITE CONDITIONS DURING THREE DIFFERENT PHASES:

   PHASE 1 – "ORIGINAL EXISTING CONDITIONS" FIELDED ON 08/06/07 SHOWN ON PAGE 1 OF 7.

   PHASE 2 –"EXCAVATED SITE" FIELDED IN AUGUST, SEPTEMBER AND OCTOBERAS SHOWN ON PAGE 2 OF 7

   PHASE 3 – "AS–BUILT" FIELDED ON 11/09/07 AS SHOWN ON PAGE 3 OF 7
4. THE PLAN IS A COMPOSITE OF SURVEY DATA (TOPOGRAPHIC) PROVIDED BY NORTHEAST CIVIL SOLUTIONS AND SURVEY DATA PROVIDED BY THE CLIENT (UTILITIES AND THEIR CORRESPONDING UNDERGROUND LOCATIONS).

SYM	DESCRIPTION	DATE	APPR

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS: SHAW ENVIRONMENTAL 500 EAST MAIN STREET NORFOLK, VIRGINIA 23510
DSGN: J.H.K. DRWN: B.O.F CHK: P.S.V.
SUPV:
PRJMGR. F. POULIN | CIV. STR.
MECH. | ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN P.M. 2/6/08
(SIGNED) (TITLE) (DATE)

APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.–ARCH: /s/ SUPV. ENG.
SPV. ENG.–CIVIL: /s/ SUPV. ENG.
SPV. ENG.–ELEC: /s/ SUPV. ENG.
SPV. ENG.–MECH: /s/ SUPV. ENG.
CI – PM & E: /s/ CI – PM & E
APPROVED:
/s/ FEAD
FEAD PWD–ME DATE

DEPARTMENT OF THE NAVY
~ NAVAL FACILITIES ENGINEERING COMMAND ~
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION – NORFOLK, VIRGINIA
IPT
PORTSMITH NAVAL SHIPYARD
KITTERY, ME

SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION
AS-BUILT SITE CONDITIONS

CODE ID. NO. 80091 | SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO–Number
SPEC. NO. 04–05–0050
CONSTR. CONTR. NO. N–62470–02–D–3260
NAVFAC DRAWING NO. 12513947
SHEET 4 OF 9
SHEET NO. C3 | PW–ME DRAWING NO. RD–08–408

DRAWFORM REVISION: 11 APRIL 2007

UNCLASSIFIED

FILE NAME: G:\Project\LANTDIV\Portsmouth\125490\12549001.dwg LAYOUT NAME: C3 – Asbuilt Conditions PLOTTED: Wednesday, July 16, 2008 – 6:24am

APPENDIX B

BACKGROUND COMPARISON

BACKGROUND COMPARISONS

Background Comparisons

The operations that resulted in the release of contamination at OU9 were oil gasification and blacksmithing. Coal (fuel) combustion during the oil gasification process and during blacksmithing activities led to the generation of ash. Ash mixed with clinkers (metallic impurities from burnt coal), assumed to be from the combustion of coal (and potentially including ash from the 1919 building fire), was buried on-site and in 2007 the majority of that ash was excavated and disposed of at a hazardous waste facility and replaced with fill material from a burrow source certified by the state of Maine. This Appendix presents the background comparisons used to determine if the chemical concentrations in the post excavation soils at OU9 are similar to or greater than the PNS Facility Background concentrations. The statistical package R version 2.9.2 and PRO UCL version 4.1.00 were used to conduct the statistical analyses.

Methodology

Statistical analyses were used to compare site surface soil, subsurface soil, and combined surface and subsurface soil at OU9 to the Portsmouth Facility Background soil concentrations to determine if the analytical results obtained from the samples represent site conditions or background/anthropogenic conditions. The results of the individual statistical analyses and final recommendations for each constituent tested are presented in Tables 1, 2, and 3 and discussed below.

The comparison of the site data with the background data was performed using side by side boxplots, normal Quantile-Quantile (Q-Q) plots, histograms, summary statistics, hypothesis tests on the mean/median, and hypothesis tests on the right tails of the datasets. For all hypothesis tests the full detection limit was used for nondetected concentrations. For the graphical displays, which were used for comparison to the hypothesis tests, ½ the detection limit was used for nondetected concentrations. The average value was used for duplicate pairs.

Box plots show the central tendency, degree of symmetry, range of variation, and potential outliers of a dataset. The dataset is shown as a rectangular box that represents the middle 50 percent of the data. The upper value of the box represents the 75th percentile and the lower value of the box represents the 25th percentile. The median is represented by the middle line in the box. Box plots for the same analyte in the two datasets were plotted on the same graph. Whiskers are drawn from the box extending outward to 1.5 times the interquartile range (difference between 75th and 25th percentiles). Concentrations that are less than the lower whisker and greater than the upper whisker are potential outliers and are plotted as circles. The plots were visually inspected to see which datasets look similar and which ones differed. Particular attention was paid to see if the median from one dataset fell within the 75th and 25th percentile range of the other datasets.

A normal Q-Q plot is a plot of the sample quantiles against the quantiles of the normal distribution. If the site and background distributions were exactly identical, the plotted values would lie on a straight line through the origin. Deviations from this line show the differences between the two distributions. If the site and background distributions are similar the scattering of the two datasets will be mixed. If there is grouping of the two datasets then datasets are most likely different. For the normal Q-Q plots presented at the end of this section the samples from the OU9 dataset were plotted using a blue circle while the samples from the Portsmouth Facility Background dataset are plotted using a red triangle.

Histograms are a visual representation of the data collected into groups. The data range is divided into several bins or classes and the data is sorted into the bins. The x-axis displays the range of the bins and the y-axis shows the number of observations that fall within the bin. The histograms of the site and background datasets were plotted on top of each other to able to compare the range of concentrations and the ranges of concentrations that have the most samples.

As stated above, the data were analyzed to determine where they are similar. A number of statistical tests can be used to determine if the datasets are similar. If the combined percentage of non-detected concentrations was between 0 and 50 percent then a formal hypothesis test was conducted such as the Wilcoxon Rank Sum test, or Gehan test. These tests were computed to test if the site dataset is greater than or equal to the background dataset by more than one background standard deviation (i.e., site data is greater than background data) as outlined in Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (USEPA, 2002). For each of the hypothesis tests there is an associated p-value which tells the credibility of the hypothesis that the site data is greater than background data. P-values are probabilities ranging from 0 to 1 with values less than 0.05 indicating that the hypothesis is not credible; therefore, the conclusion is that site data are within background.

The Wilcoxon Rank-Sum (WRS) nonparametric test is used to test for a shift in location between two independent populations. The WRS test can be used when the data does not follow a normal distribution and when a moderate number of nondetected values are present.

The Gehan nonparametric test is used to test for a shift in location between two independent populations. The Gehan test can be used instead of the WRS test when the background or site datasets contain multiple nondetects with different reporting limits.

The Quantile test is used to identify the differences in the right tails of the site and background distributions. This may be regarded as detecting if the values in the right-tail of the site population are greater than the right-tail of the background distribution. The test is valid regardless of the underlying distribution of the site and background datasets.

The Slippage test is used to test for a shift to the right in the extreme right-tail of the site versus the background concentrations. This is equivalent to asking if a set of the largest values of the site distribution are larger than the maximum value of the background distribution. This test can be used regardless of the underlying distribution of the site and background datasets.

If any of the statistical analyses concluded that the site concentrations are shifted above background concentrations than the final recommendation shown on Tables 1 and 2 was that the site concentrations are greater than background concentrations.

Surface Soil Statistical Results

Figure 1 presents the graphical displays for antimony in surface soil. The side by side boxplots, normal Q-Q plot, and histograms show that the site concentrations are shifted below the Facility Background concentrations. The boxplot displays this by showing that the OU9 boxplot is shifted below the Facility Background boxplot. The maximum OU9 concentration (largest outlier) is less than the lower whisker of the background dataset. The normal Q-Q plot indicates the shift by showing that the datasets are grouped with the OU9 concentrations falling in the lower portion of the quantiles. The histograms show the shift by the majority of the OU9 concentrations falling before the first bin of the Facility background concentrations. There were only two detected background concentrations therefore meaningful statistical hypotheses tests could not be conducted. Therefore based on the graphical evaluations it was concluded that the OU9 antimony surface soil concentrations are within background concentrations.

Figure 2 presents the graphical displays for lead in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations with one OU9 concentration elevated above the rest of the data. The boxplots display this similarity with the concentration ranges and the shape of the two datasets being similar. There is one OU9 outlier that is elevated above the rest of the data. The normal Q-Q plots displays this similarity by showing that there is mixing of the two datasets. Again the one OU9 potential outlier is elevated above the rest of the data. The histograms show that the

two datasets have a similar range of concentrations and shape (both are skewed right) with the one OU9 concentration elevated above the rest of the samples in the two datasets. The OU9 and background datasets were all detected and the distributions were determined to be nonparametric. Therefore the WRS test was used to compare the median concentrations of the two datasets. The p-value for the WRS test was 0.00081; therefore it can be concluded that the median OU9 surface soil lead concentration is not greater than the background median concentration by more than one background standard deviation. The Slippage test and the Quantile test both indicate that the right tail (higher concentrations) of the OU9 dataset are not statistically greater than the right tail of the background dataset. Therefore, based on the results of the graphical evaluation, WRS test, Slippage test, and Quantile test it was concluded that the OU9 lead surface soil concentrations are within background.

Figure 3 presents the graphical displays for mercury in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots display this similarity with the boxes having similar shapes and concentration ranges. The normal Q-Q plots displays this similarity by showing that there is mixing of the two datasets. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The background dataset contained non-detected concentrations with multiple detection limits therefore the Gehan test was used to compare the median concentrations of the two datasets. The p-value for the Gehan test was 0.37; indicating the median OU9 surface soil mercury concentration is greater than the background median concentration by more than one background standard deviation. The Slippage test and the Quantile test both indicate that the right tail (higher concentrations) of the OU9 dataset are not statistically greater than the right tail of the background dataset. Based on the results of the Gehan test it was concluded that the OU9 mercury surface soil concentrations are greater than background.

Figure 4 presents the graphical displays for 2-methylnaphthalene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are shifted below the Facility Background concentrations. The boxplots display this shift by the maximum OU9 concentration (largest outlier) being less than the lower whisker of the Facility Background dataset. The normal Q-Q plot shows this shift by the OU9 concentrations only being plotted in the lower tail of the combined dataset. The histogram shows this shift by the OU9 concentrations being plotted to the left of the majority of the Facility Background concentrations. There was only one detected background concentration therefore meaningful statistical hypothesis tests could not be conducted. Therefore based on the graphical evaluation it was concluded that the OU9 2-methynaphthalene concentrations are greater than background.

Figure 5 presents the graphical displays for chrysene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The range of the Facility Background and OU9 boxplots are similar. There are three OU9 concentrations that are elevated above the rest of the datasets. The normal Q-Q plot shows a mixing of the two datasets with the three largest concentrations coming from the OU9 dataset. The histograms show a similar range of concentrations for the majority of the data. The three largest OU9 concentrations are separated from the rest of the datasets. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.00956 indicating that the OU9 median concentration is not greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Therefore based on the graphical evaluation, Gehan test, Slippage test, and Quantile test it was concluded that the OU9 chrysene surface soil concentrations are within background concentrations.

Figure 6 presents the graphical displays for acenaphthene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the

Facility Background concentrations. The boxplots show that the majority of the OU9 concentrations are shifted below the Facility Background data (upper whisker of OU9 boxplot is less than the lower whisker of the Facility Background boxplot). However, there are two OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and the Facility Background concentrations falling in the upper tail of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The two largest OU9 concentrations appear to be shifted above the rest of the data. Acenaphthene was not detected in the background dataset therefore meaningful statistical hypothesis test could not be conducted. Based on the graphical evaluation the OU9 acenaphthene surface soil concentrations are greater than background concentrations.

Figure 7 presents the graphical displays for acenaphthylene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots show that the majority of the OU9 concentrations are shifted below the Facility Background data (upper whisker of OU9 boxplot is less than the lower whisker of the Facility Background boxplot). However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and the Facility Background concentrations falling in the upper tail of the combined distribution. There are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The two largest OU9 concentrations appear to be shifted above the rest of the data. Acenaphthylene was detected only once in the background dataset therefore meaningful statistical hypothesis test could not be conducted. Based on the graphical evaluation the OU9 acenaphthylene surface soil concentrations are greater than background concentrations.

Figure 8 presents the graphical displays for anthracene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots show that the range of the Facility Background datasets falls within the majority of the OU9 concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the Facility Background concentrations falling in the middle of the OU9 data range. There are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The three largest OU9 concentrations appear to be shifted above the rest of the data. Anthracene was only detected twice in the background dataset therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 anthracene surface soil concentrations are greater than background concentrations.

Figure 9 presents the graphical displays for benzo(a)anthracene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots show that the range of the Facility Background datasets falls within the majority of the OU9 concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The three largest OU9 concentrations appear to be shifted above the rest of the data. The OU9 and background datasets both had non-detected concentrations at multiple detections limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.611 indicating that the OU9 surface soil median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage test indicates that the right tail of the OU9 dataset is not greater than the right tail of the background dataset.

However, the Quantile test indicates that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan test and because the Quantile test indicates that the OU9 right tail is greater than the background right tail it was concluded that the OU9 benzo(a)anthracene surface soil concentrations are greater than the background concentrations.

Figure 10 presents the graphical displays for benzo(a)pyrene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The two boxplots have similar shape and range of concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The three largest OU9 concentrations appear to be shifted above the rest of the data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0843 indicating that the OU9 median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Based on the Gehan test it was be concluded that the OU9 benzo(a)pyrene surface soil concentrations are greater than background concentrations.

Figure 11 presents the graphical displays for benzo(b)fluoranthene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The two boxplots have similar shape and range of concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The three largest OU9 concentrations appear to be shifted above the rest of the data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.00763 indicating that the OU9 median concentration is not greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Therefore based on the graphical evaluation, Gehan test, Slippage test, and Quantile test it was concluded that the OU9 benzo(b)fluoranthene surface soil concentrations are within background concentrations.

Figure 12 presents the graphical displays for benzo(g,h,i)perylene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The range of Facility Background concentrations falls within the OU9 box and whiskers. However, there are two OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The three largest OU9 concentrations appear to be shifted above the rest of the data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.419 indicating that the OU9 median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Based on the Gehan test it was concluded that the OU9 benzo(g,h,i)perylene surface soil concentrations are greater than background concentrations.

Figure 13 presents the graphical displays for benzo(k)fluoranthene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The two boxplots have a similar range of concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The three largest OU9 concentrations appear to be shifted above the rest of the data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.183 indicating that the OU9 median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Based on the Gehan test it was concluded that the OU9 benzo(k)fluoranthene surface soil concentrations are greater than background concentrations.

Figure 14 presents the graphical displays for dibenzo(a,h)anthracene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots show that the majority of the OU9 concentrations are below the Facility Background concentrations. This can be seen by the upper whisker of the OU9 boxplot being roughly equal to the lower whisker of the Facility Backgorund boxplot. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of datasets with the majority of the OU9 concentrations falling in the lower tail of the combined dataset. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The largest OU9 concentration appears to be shifted above the rest of the data. Dibenzo(a,h)anthracene was only detected twice in the background dataset therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 dibenzo(a,h)anthracene surface soil concentrations are greater than background concentrations.

Figure 15 presents the graphical displays for fluoranthene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The two boxplots have a similar range of concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets. However, there are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the majority of the two datasets have a similar range of concentrations. The three largest OU9 concentrations appear to be shifted above the rest of the data. Non-detected concentrations were present in the background dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.232 indicating that the OU9 median concentration is not greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Based on the Gehan test it was concluded that the OU9 fluoranthene surface soil concentrations are great than background concentrations.

Figure 16 presents the graphical displays for fluorene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The range of Facility Background concentrations falls between the OU9 box and whiskers. However, there are two OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail of the combined dataset. However, there are two OU9 concentrations that are elevated above the rest of the data. The histograms show that the majority of the two datasets have a similar range of concentrations

and shape (both are skewed right). The two largest OU9 concentrations appear to be shifted above the rest of the data. There was only one detected background concentration therefore meaningful statistical hypothesis tests could not be conducted. Therefore based on the graphical evaluation it was concluded that the OU9 fluorene surface soil concentrations are greater than background.

Figure 17 presents the graphical displays for indeno(1,2,3-cd)pyrene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots show that the range of the Facility Background datasets falls within the majority of the OU9 concentrations. However, there are three OU9 outliers are that elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the Facility Background concentrations falling in the middle of the OU9 data range. There are three OU9 concentrations that are elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations. The three largest OU9 concentrations appear to be shifted above the rest of the data. Non-detected concentrations were present in the background dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.338 indicating that the OU9 median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the Quantile test. Based on the Gehan test it was concluded that the OU9 indeno(1,2,3-cd)pyrene surface soil concentrations are greater than background concentrations.

Figure 18 presents the graphical displays for naphthalene in surface soil. The side by side boxplots, normal Q-Q plot, and histograms show that the site concentrations are similar to Facility Background concentrations. The OU9 boxplot is shifted below the Facility Background boxplot however there is one OU9 outlier that is elevated above the background maximum concentration. The normal Q-Q plot shows a separation of datasets by the OU9 concentraitons mainly occurring in the lower tail of the combined dataset. However there is on OU9 concentration that is in the upper tail of the combined dataset and is greater than the maximum Facility Background concentration. The histograms show that the majority of the OU9 concentrations are less than the majority of the Facility Background concentrations. However there is one OU9 concentration that is elevated above the rest of the OU9 data and is similar to the Facility Background concentrations. Naphthalene was only detected twice in the background dataset therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 napthalene surface soil concentrations are greater than background concentrations.

Figure 19 presents the graphical displays for phenanthrene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The range of the Facility Background boxplot is shifted slightly below the OU9 boxplots (Facility Background upper whisker similar to OU9 median). There are two OU9 concentrations that are elevated above the rest of the datasets. The normal Q-Q plot shows a mixing of the two datasets with the five largest concentrations coming from the OU9 dataset the two largest are elevated above the rest of the data. The histograms show a similar range of concentrations for the majority of the data. The five largest OU9 concentrations are greater than the Facility Background maximum. The three largest OU9 concentrations appear to be shifted above the rest of the data. The background dataset had non-detected concentrations at multiple detections limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.993 indicating that the OU9 surface soil median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage test and Quantile tests both indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan test and because the Quantile test indicates that the OU9 right tail is greater than the

background right tail it was concluded that the OU9 phenanthrene surface soil concentrations are greater than the background concentrations.

Figure 20 presents the graphical displays for pyrene in surface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The range of the Facility Background boxplot is shifted slightly below the OU9 boxplots (Facility Background upper whisker similar to OU9 median). There are three OU9 concentrations that are elevated above the rest of the datasets. The normal Q-Q plot shows a mixing of the two datasets with the three largest concentrations coming from the OU9 (these three concentrations are elevated above the rest of the data). The histograms show a similar range of concentrations for the majority of the data. The three largest OU9 concentrations are greater than the Facility Background maximum. The OU9 site dataset had non-detected concentrations at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.214 indicating that the median site concentration is greater than the median background concentration by more than one background standard deviation. The Slippage and the Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the background dataset. Based on the results of the Gehan test it was concluded that the OU9 pyrene surface soil concentrations are greater than background concentrations.

Subsurface Soil Statistical Results

Figure 1 presents the graphical displays for antimony in subsurface soil. The side by side boxplots, normal Q-Q plot, and histograms show that the site concentrations are shifted below the Facility Background concentrations. The boxplot displays this by showing that the OU9 maximum concentration is roughly equal to the Facility Background median. The normal Q-Q plot indicates the shift by showing that the datasets are grouped with the OU9 concentrations falling in the lower portion of the quantiles and the Facility Background concentrations falling in the upper quantiles of the combined dataset. The histograms show the shift by the majority of the OU9 concentrations falling before the first bin of the Facility background concentrations. Antimony was only detected twice in the background dataset, therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 antimony subsurface soil concentrations are within the background concentrations.

Figure 2 presents the graphical displays for lead in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots display this similarity with the concentration ranges and the shape of the two datasets being similar. The normal Q-Q plots displays this similarity by showing that there is mixing of the two datasets. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). The OU9 and background concentrations were all detected and the data distributions were determined to be nonparametric therefore the WRS test was used to compare median concentrations. The p-value for the WRS test was 0.000000274 indicating that the OU9 median concentration is not greater than the background median concentration by more than one background standard deviation. The Slippage and Quantile test both indicate that the right tail of the OU9 dataset is not greater than the right tail of the background dataset. Based on the graphical evaluation, WRS test, Slippage test, and Quantile test the OU9 lead subsurface soil concentrations are within background concentrations.

Figure 3 presents the graphical displays for mercury in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots display this similarity with the boxes having similar concentration ranges. The normal Q-Q plots displays this similarity by showing that there is mixing of the two datasets. However the three largest concentrations are from the OU9 dataset and they appear to be elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). There are

three OU9 concentrations that are elevated above the rest of the data. There were non-detected background concentrations present at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.453 indicating that the site median is greater than the background median by more than one background standard deviation. The Slippage and Quantile tests both indicate that the right tail of the OU9 dataset is not greater than the right tail of the background dataset. Based on the Gehan test it was concluded that the OU9 mercury subsurface soil concentrations are greater than background concentrations.

Figure 4 presents the graphical displays for 2-methylnaphthalene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots display this shift by the maximum OU9 concentration (largest outlier) being several orders of magnitude above the maximum Facility Background concentration. The normal Q-Q plot shows a grouping of datasets with the majority of the site concentrations occurring in the lower tail of the combined dataset. One OU9 concentration is several orders of magnitude above the Facility Background maximum concentration. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. 2-methylnaphthalene was only detected once in the background dataset and therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 2-methylnaphthalene subsurface soil concentrations are greater than background concentrations.

Figure 5 presents the graphical displays for chrysene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots display this shift by the maximum OU9 concentration (largest outlier) being several orders of magnitude above the maximum Facility Background concentration. The normal Q-Q plot shows a mixing of the combined dataset however the seven largest concentrations are from the OU9 dataset. One OU9 concentration is several orders of magnitude above the Facility Background maximum concentration. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in the OU9 and background datasets at multiple detection limits; therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0157 indicating that the median OU9 concentration is not greater than the median background concentration by more than one background standard deviation. The Slippage and Quantile test both indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the chrysene subsurface soil concentrations are greater than the background concentrations.

Figure 6 presents the graphical displays for acenaphthene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Acenaphthene was not detected in the background dataset. Therefore based on the graphical evaluation it was concluded that the OU9 acenaphthene subsurface soil concentrations are greater than the background concentrations.

Figure 7 presents the graphical displays for acenaphthylene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the

Facility Background concentrations. The boxplots show there are two OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Acenaphthylene was only detected once in the background dataset therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 acenaphthylene subsurface soil concentrations are greater than the background concentrations.

Figure 8 presents the graphical displays for anthracene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Anthracene was only detected twice in the background dataset therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 anthracene subsurface soil concentrations are greater than background concentrations.

Figure 9 presents the graphical displays for benzo(a)anthracene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.182 indicating that the OU9 median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage and Quantile test both indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 benzo(a)anthracene subsurface concentrations are greater than the background concentrations.

Figure 10 presents the graphical displays for benzo(a)pyrene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the two datasets only in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data and the nine largest concentrations are from the OU9 dataset. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-

value for the Gehan test was 0.117 indicating that the OU9 median concentration is greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 benzo(a)pyrene subsurface soil concentrations are greater than the background concentrations.

Figure 11 presents the graphical displays for benzo(b)fluoranthene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the two datasets only in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data and the nine largest concentrations are from the OU9 dataset. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0314 indicating that the OU9 median concentration is not greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the OU9 benzo(b)fluoranthene subsurface soil concentrations are greater than the background concentrations.

Figure 12 presents the graphical displays for benzo(g,h,i)perylene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.748 indicating that the OU9 median concentration is greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 benzo(g,h,i)pyrene subsurface soil concentrations are greater than the background concentrations.

Figure 13 presents the graphical displays for benzo(k)fluoranthene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-

value for the Gehan test was 0.37 indicating that the OU9 median concentration is greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 benzo(k)fluoranthene subsurface soil concentrations are greater than the background concentrations.

Figure 14 presents the graphical displays for dibenzo(a,h)anthracene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Dibenzo(a,h)anthracene was detected only twice in the background dataset and therefore meaningful statistical evaluations could not be conducted. Based on the graphical evaluations it was concluded that the OU9 dibenzo(a,h)anthracene subsurface soil concentrations are greater than the background concentrations.

Figure 15 presents the graphical displays for fluoranthene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0261 indicating that the OU9 median concentration is not greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the OU9 fluoranthene subsurface soil concentrations are greater than the background concentrations.

Figure 16 presents the graphical displays for fluorene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are two OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Fluorene was detected only once in the background dataset and therefore meaningful statistical evaluations could not be conducted. Based on the graphical evaluations it was concluded that the OU9 fluorene subsurface soil concentrations are greater than the background concentrations.

Figure 17 presents the graphical displays for indeno(1,2,3-cd)pyrene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater

than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.646 indicating that the OU9 median concentration is greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage and Quantile tests it was concluded that the OU9 indeno(1,2,3-cd)pyrene subsurface soil concentrations are greater than the background concentrations.

Figure 18 presents the graphical displays for naphthalene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there is one OU9 concentration that is elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Naphthalene was only detected twice in the background dataset therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 naphthalene subsurface soil concentrations are greater than background concentrations.

Figure 19 presents the graphical displays for phenanthrene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.281 indicating that the OU9 median concentration is greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage and Quantile tests it was concluded that the OU9 phenanthrene subsurface soil concentrations are greater than the background concentrations.

Figure 20 presents the graphical displays for pyrene in subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets only in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is

one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0191 indicating that the OU9 median concentration is not greater than the background concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the OU9 pyrene subsurface soil concentrations are greater than the background concentrations.

Combined Surface and Subsurface Soil Statistical Results

Figure 1 presents the graphical displays for antimony in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plot, and histograms show that the site concentrations are shifted below the Facility Background concentrations. The boxplot displays this by showing that the OU9 maximum concentration is roughly equal to the Facility Background median. The normal Q-Q plot indicates the shift by showing that the datasets are grouped with the OU9 concentrations falling in the lower portion of the quantiles and the Facility Background concentrations falling in the upper quantiles of the combined dataset. The histograms show the shift by the majority of the OU9 concentrations falling before the first bin of the Facility background concentrations. Anthracene was only detected twice in the background dataset and therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 combined soil dataset is similar to background.

Figure 2 presents the graphical displays for lead in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots display this similarity with the concentration ranges and the shape of the two datasets being similar. The OU9 boxplot shows one outlier that is elevated above the rest of the data. The normal Q-Q plots displays this similarity by showing that there is mixing of the two datasets. Again the maximum OU9 concentration is elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right). There is one OU9 concentration that is separated from the rest of the datasets. The distributions of the background and OU9 datasets were determined to be nonparametric and the concentrations were all detections therefore the WRS test was used to compare median concentrations. The p-value for the WRS test was 4.2×10^{-7} indicating that the site median concentration is not greater than the background median concentration by more than one background standard deviation. The Slippage test and the Quantile test indicate that the right tail of the OU9 dataset is not greater than the background right tail. Based on the graphical evaluation, WRS test, Slippage test, and Quantile test it was concluded that the OU9 combined soil dataset is similar to background.

Figure 3 presents the graphical displays for mercury in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are similar to the Facility Background concentrations. The boxplots display this similarity with the boxes having similar concentration ranges. Note that there are two OU9 concentrations that are elevated above the rest of the data. The normal Q-Q plots displays this similarity by showing that there is mixing of the two datasets. However the three largest concentrations are from the OU9 dataset and they appear to be elevated above the rest of the data. The histograms show that the two datasets have a similar range of concentrations and shape (both are skewed right); however there are three OU9 concentration that are separated above the rest of the data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits, therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.481 indicating that the OU9 median concentration is greater than the background median concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is not greater than the right tail of the background dataset. Based on the Gehan test it was concluded that the OU9 combined soil dataset is greater than background.

Figure 4 presents the graphical displays for 2-methylnaphthalene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots display this shift by the maximum OU9 concentration (largest outlier) being several orders of magnitude above the maximum Facility Background concentration. The normal Q-Q plot shows a grouping of datasets with the majority of the site concentrations occurring in the lower tail of the combined dataset. One OU9 concentration is several orders of magnitude above the Facility Background maximum concentration. The histogram shows that the majority of the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. 2-methylnaphthalene was only detected once in the background dataset and therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 combined soil dataset is greater than background.

Figure 5 presents the graphical displays for chrysene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots display this shift by the maximum OU9 concentration (largest outlier) being several orders of magnitude above the maximum Facility Background concentration. The normal Q-Q plot shows a mixing of the combined dataset in the middle of the combined dataset however the ten largest concentrations are from the OU9 dataset. One OU9 concentration is several orders of magnitude above the Facility Background maximum concentration. The histogram shows that the majority of the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the OU9 and background datasets at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value associated with the Gehan test was 0.000002 indicating that the OU9 median concentration does not exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile tests indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile test it was concluded that the OU9 combined soil dataset is greater than background.

Figure 6 presents the graphical displays for acenaphthene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that all of the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Acenaphthene was not detected in the background dataset and therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 combined dataset is greater than background.

Figure 7 presents the graphical displays for acenaphthylene in combines surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are two OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that all of the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9

concentration that is several orders of magnitude above the Facility Background data. Acenaphthylene was only detected in one background sample therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 combined dataset is greater than background.

Figure 8 presents the graphical displays for anthracene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Anthracene was only detected in two background samples therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphic evaluation it was concluded that the OU9 combined dataset is greater than background.

Figure 9 presents the graphical displays for benzo(a)anthracene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the Facility Background concentrations falling in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.301 indicating that the OU9 median concentration does exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile tests indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 10 presents the graphical displays for benzo(a)pyrene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the two datasets only in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data and the 12 largest concentrations are from the OU9 dataset. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0902 indicating that the OU9 median concentration does not exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 11 presents the graphical displays for benzo(b)fluoranthene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there

are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the two datasets only in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data and the 12 largest concentrations are from the OU9 dataset. The histogram shows that the Facility Background concentrations fall in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0125 indicating that the OU9 median concentration does not exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 12 presents the graphical displays for benzo(g,h,i)perylene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.651 indicating that the OU9 median concentration does exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 13 presents the graphical displays for benzo(k)fluoranthene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.295 indicating that the OU9 median concentration does exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 14 presents the graphical displays for dibenzo(a,h)anthracene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background

concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Dibenzo(a,h)anthracene was only detected in two background samples therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations it was concluded that the OU9 dataset is greater than background.

Figure 15 presents the graphical displays for fluoranthene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the Facility Background concentrations falling in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.0487 indicating that the OU9 median concentration does not exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile tests indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 16 presents the graphical displays for fluorene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Fluorene was only detected in one background sample therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluations the OU9 combined dataset is greater than background.

Figure 17 presents the graphical displays for indeno(1,2,3-cd)pyrene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.546 indicating that the OU9 median concentration does exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile test indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 18 presents the graphical displays for naphthalene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are two OU9 concentration that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the majority of the OU9 concentrations falling in the lower tail and upper tail while the Facility Background concentrations fall in the middle of the combined distribution. There is one OU9 concentration elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Naphthalene was detected in only two background sample therefore meaningful statistical hypothesis tests could not be conducted. Based on the graphical evaluation it was concluded that the OU9 combined dataset is greater than background.

Figure 19 presents the graphical displays for phenanthrene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a grouping of the two datasets with the Facility Background concentrations falling only in the middle of the combined distribution. There are two OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.572 indicating that the OU9 median concentration does exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile tests indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Gehan, Slippage, and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

Figure 20 presents the graphical displays for pyrene in combined surface and subsurface soil. The side by side boxplots, normal Q-Q plots, and histograms show that the site concentrations are greater than the Facility Background concentrations. The boxplots show there are four OU9 concentrations that are elevated above the Facility Background maximum concentration. The normal Q-Q plots displays a mixing of the datasets only in the middle of the combined distribution. There are four OU9 concentrations that are elevated above the rest of the data. The histogram shows that the Facility Background concentrations occur in the first bin of the OU9 concentrations and there is one OU9 concentration that is several orders of magnitude above the Facility Background data. Non-detected concentrations were present in both the background and OU9 dataset at multiple detection limits therefore the Gehan test was used to compare median concentrations. The p-value for the Gehan test was 0.03733 indicating that the OU9 median concentration does not exceed the background median concentration by more than one background standard deviation. The Slippage and Quantile tests indicate that the right tail of the OU9 dataset is greater than the right tail of the background dataset. Based on the Slippage and Quantile tests it was concluded that the OU9 combined dataset is greater than background.

TABLE 1
SURFACE SOIL BACKGROUND COMPARISONS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

Parameter	Background FOD	Site FOD	Total FOD	Background Maximum Detected Concentration(1)	Background Maximum Nondetect Concentration(1)	Site Maximum Detected Concentration(1)	Site Maximum NonDetect Concentration(1)	Graphical Display Comparison(2)	Percentage Non-Detect	Background Distribution(3)	Number Site DLs	Number Backgro und DLs	Site Distribution(3)	Hypothesis Test	Background Standard Deviation	Hypothesis Test Pvalue	Hypothesis Test Conclusion(2)	Number Site concentrations Greater than Background	Slippage Test(3,4)	Number Site that are in the 6 Largest Concentrations	Quantile Test(3,5)	Final Conclusion(6)
INORGANICS																						
ANTIMONY	2 / 25	12 / 19	14 / 44	9.4	10.2	2.3	0.45	Less	68.18	Assumed Nonparametric	7	19	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Within Background
LEAD	25 / 25	19 / 19	44 / 44	1100	--	3697	--	Similar	0	Nonparametric	0	0	Nonparametric	WRS	240	8.81E-04	Less	1	Less	3	Less	Site Within Background
MERCURY	6 / 25	19 / 19	25 / 44	1.8	0.31	1.1	--	Similar	43.18	Nonparametric	0	13	Nonparametric	Gehan	0.35	0.37	Greater	0	Less	0	Less	Site Greater Background
PAHS																						
2-METHYLNAPHTHALENE	1 / 25	7 / 10	8 / 35	44	430	140	4	Less	77.14	Assumed Nonparametric	3	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
CHRYSENE	20 / 25	18 / 19	38 / 44	1600	400	4775	3.8	Similar	13.64	Nonparametric	1	4	Nonparametric	Gehan	320	0.00956	Less	3	Less	4	Less	Site Within Background
ACENAPHTHENE	0 / 25	15 / 19	15 / 44	--	430	530	4	Similar	65.91	Assumed Nonparametric	4	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
ACENAPHTHYLENE	1 / 25	16 / 19	17 / 44	74	430	1165	4	Similar	61.36	Assumed Nonparametric	3	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
ANTHRACENE	2 / 25	17 / 19	19 / 44	62	430	2400	3.8	Similar	56.82	Assumed Nonparametric	2	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
BENZO(A)ANTHRACENE	15 / 25	18 / 19	33 / 44	640	400	4250	3.8	Similar	25	Nonparametric	1	5	Nonparametric	Gehan	140	0.611	Greater	4	Less	5	Greater	Site Greater Background
BENZO(A)PYRENE	15 / 25	18 / 19	33 / 44	1100	400	4110	3.8	Similar	25	Nonparametric	1	5	Nonparametric	Gehan	210	0.0843	Greater	3	Less	4	Less	Site Greater Background
BENZO(B)FLUORANTHENE	18 / 25	18 / 19	36 / 44	1700	400	4650	3.8	Similar	18.18	Nonparametric	1	5	Nonparametric	Gehan	320	0.00763	Less	3	Less	4	Less	Site Within Background
BENZO(G,H,I)PERYLENE	7 / 25	18 / 19	25 / 44	410	410	1940	3.8	Similar	43.18	Nonparametric	1	6	Nonparametric	Gehan	87	0.419	Greater	3	Less	**3**	Less	Site Greater Background
BENZO(K)FLUORANTHENE	9 / 25	18 / 19	27 / 44	1100	430	2745	3.8	Similar	38.64	Nonparametric	1	7	Nonparametric	Gehan	220	0.183	Greater	3	Less	**3**	Less	Site Greater Background
DIBENZO(A,H)ANTHRACENE	2 / 25	16 / 19	18 / 44	190	430	865	4	Similar	59.09	Assumed Nonparametric	3	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
FLUORANTHENE	20 / 25	19 / 19	39 / 44	1700	390	6050	--	Similar	11.36	Nonparametric	0	3	Nonparametric	Gehan	370	0.232	Greater	3	Less	4	Less	Site Greater Background
FLUORENE	1 / 25	15 / 19	16 / 44	42	430	1100	4	Similar	63.64	Assumed Nonparametric	4	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
INDENO(1,2,3-CD)PYRENE	8 / 25	18 / 19	26 / 44	440	410	1860	3.8	Similar	40.91	Nonparametric	1	6	Nonparametric	Gehan	91	0.338	Greater	3	Less	**3**	Less	Site Greater Background
NAPHTHALENE	2 / 25	15 / 19	17 / 44	43	430	240	4	Similar	61.36	Assumed Nonparametric	4	8	Nonparametric	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
PHENANTHRENE	14 / 25	18 / 19	32 / 44	470	400	5500	3.8	Similar	27.27	Nonparametric	1	5	Nonparametric	Gehan	91	0.933	Greater	7	Greater	6	Greater	Site Greater Background
PYRENE	21 / 25	19 / 19	40 / 44	1400	390	5400	--	Similar	9.09	Nonparametric	0	3	Nonparametric	Gehan	310	0.214	Greater	3	Less	4	Less	Site Greater Background

Notes:
(1) Units for inorganics are mg/kg. Units for PAHs are ug/kg.
(2) For the background comparisons the following codes were used:
Less = Site concentrations are shifted below background.
Similar = Site concentrations are similar to background.
Greater = Site concentrations are shifted above background.
(3) Shapiro Wilks test with a significance level of 0.05 was used to determine distribution.
(4) Slippage test was conducted at 0.05 significance level and concluded that the site concentrations are shifted above background if more than 6 site concentrations are greater than the maximum background concentration.
Critical values for the Slippage test were obtained from Table C-3 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.
(5) Quantile test was conducted at 0.05 significance level and concluded that site was greater than background if 5 of the 6 largest concentrations are from the site dataset.
Critical values for the Quantile test were obtained from Table C-6 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.
(6) If the graphical evaluation and all three statistical tests conclude that the site data set concentrations are shifted below background the final conclusion is that site is within background.
If any of the four evaulations concludes that site concentrations are shifted above background concentrations the final conclusion is that site concentrations are greater than background.
(7) There are less than three detected background concentrations. A meaningfull hypothesis tests could not be computed final conclusion based on comparison of maximum detected and maximum nondetected concentration.

Abbreviations:
FOD = Frequency of Detection
NA = Not Applicable
WRS = Wilcoxon Rank Sum Test

TABLE 2
SUBSURFACE SOIL BACKGROUND COMPARISONS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

Parameter	Background FOD	Site FOD	Total FOD	Background Maximum Detected Concentration(1)	Background Maximum Nondetect Concentration(1)	Site Maximum Detected Concentration(1)	Site Maximum NonDetect Concentration(1)	Percentage Non-Detect	Graphical Display Comparison(2)	Site Distribution	Background Distribution	Number Site DLs	Number Background DLs	Hypothesis Test	d Standard	Hypothesis Test Pvalue	Hypothesis Test Conclusion(2)	Number Site concentrations Greater than Background	Slippage Test(3,4)	Number Site that are in the 6 Largest Concentrations	Quantile Test(3,5)	Final Conclusion(6)
INORGANICS																						
ANTIMONY	2 / 25	16 / 38	18 / 63	9.4	10.2	3.7	1.1	71.43	Less	Nonparametric	Assumed Nonparametric	18	19	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Within Background
LEAD	25 / 25	38 / 38	63 / 63	1100	--	1180	--	0	Similar	Nonparametric	Nonparametric	0	0	WRS	240	2.74E-07	Less	1	Less	5	Less	Site Within Background
MERCURY	6 / 25	34 / 38	40 / 63	1.8	0.31	8.2	0.025	36.51	Similar	Nonparametric	Nonparametric	4	13	Gehan	0.35	0.453	Greater	3	Less	5	Less	Site Greater Background
PAHS																						
2-METHYLNAPHTHALENE	1 / 25	4 / 18	5 / 43	44	430	560000	4	88.37	Greater	Nonparametric	Assumed Nonparametric	6	8	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
CHRYSENE	20 / 25	29 / 38	49 / 63	1600	400	420000	3.8	22.22	Greater	Nonparametric	Nonparametric	4	4	Gehan	320	0.0157	Less	7	Greater	6	Greater	Site Greater Background
ACENAPHTHENE	0 / 25	18 / 38	18 / 63	--	430	100000	4	71.43	Greater	Nonparametric	Assumed Nonparametric	6	8	No Hypothesis Test(7)	11	NA	NA	NA	NA	NA	NA	Site Greater Background
ACENAPHTHYLENE	1 / 25	24 / 38	25 / 63	74	430	370000	3.8	60.32	Greater	Nonparametric	Assumed Nonparametric	4	8	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
ANTHRACENE	2 / 25	25 / 38	27 / 63	62	430	290000	3.8	57.14	Greater	Nonparametric	Assumed Nonparametric	4	8	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
BENZO(A)ANTHRACENE	15 / 25	29 / 38	44 / 63	640	400	410000	3.8	30.16	Greater	Nonparametric	Nonparametric	4	5	Gehan	140	0.182	Greater	22	Greater	6	Greater	Site Greater Background
BENZO(A)PYRENE	15 / 25	29 / 38	44 / 63	1100	400	450000	3.8	30.16	Greater	Nonparametric	Nonparametric	4	5	Gehan	210	0.117	Greater	9	Greater	6	Greater	Site Greater Background
BENZO(B)FLUORANTHENE	18 / 25	30 / 38	48 / 63	1700	400	360000	3.8	23.81	Greater	Nonparametric	Nonparametric	3	5	Gehan	320	0.0314	Less	8	Greater	6	Greater	Site Greater Background
BENZO(G,H,I)PERYLENE	7 / 25	30 / 38	37 / 63	410	410	230000	3.8	41.27	Greater	Nonparametric	Nonparametric	4	6	Gehan	87	0.748	Greater	10	Greater	6	Greater	Site Greater Background
BENZO(K)FLUORANTHENE	9 / 25	28 / 38	37 / 63	1100	430	130000	3.8	41.27	Greater	Nonparametric	Nonparametric	4	7	Gehan	220	0.37	Greater	8	Greater	6	Greater	Site Greater Background
DIBENZO(A,H)ANTHRACENE	2 / 25	24 / 38	26 / 63	190	430	66000	3.8	58.73	Greater	Nonparametric	Assumed Nonparametric	4	8	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
FLUORANTHENE	20 / 25	33 / 38	53 / 63	1700	390	550000	3.8	15.87	Greater	Nonparametric	Nonparametric	2	3	Gehan	370	0.0261	Less	8	Greater	6	Greater	Site Greater Background
FLUORENE	1 / 25	23 / 38	24 / 63	42	430	320000	3.8	61.9	Greater	Nonparametric	Assumed Nonparametric	4	8	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
INDENO(1,2,3-CD)PYRENE	8 / 25	27 / 38	35 / 63	440	410	160000	3.8	44.44	Greater	Nonparametric	Nonparametric	4	6	Gehan	91	0.646	Greater	10	Greater	6	Greater	Site Greater Background
NAPHTHALENE	2 / 25	23 / 38	25 / 63	43	430	640000	3.9	60.32	Greater	Nonparametric	Assumed Nonparametric	5	8	No Hypothesis Test(7)	1.4	NA	NA	NA	NA	NA	NA	Site Greater Background
PHENANTHRENE	14 / 25	33 / 38	47 / 63	470	400	1300000	3.8	25.4	Greater	Nonparametric	Nonparametric	2	5	Gehan	91	0.281	Greater	9	Greater	6	Greater	Site Greater Background
PYRENE	21 / 25	33 / 38	54 / 63	1400	390	910000	3.8	14.29	Greater	Nonparametric	Nonparametric	2	3	Gehan	310	0.0191	Less	9	Greater	6	Greater	Site Greater Background

Notes:
(1) Units for inorganics are mg/kg. Units for PAHs are ug/kg.
(2) For the background comparisons the following codes were used:
Less = Site concentrations are shifted below background.
Similar = Site concentrations are similar to background.
Greater = Site concentrations are shifted above background.
(3) Shapiro Wilks test with a significance level of 0.05 was used to determine distribution.
(4) Slippage test was conducted at 0.05 significance level and concluded that the site concentrations are shifted above background if more than 6 site concentrations are greater than the maximum background concentration.
Critical values for the Slippage test were obtained from Table C-3 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.
(5) Quantile test was conducted at 0.05 significance level and concluded that site was greater than background if 6 of the 6 largest concentrations are from the site dataset.
Critical values for the Quantile test were obtained from Table C-6 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.
(6) If the graphical evaluation and all three statistical tests conclude that the site data set concentrations are shifted below background the final conclusion is that site is within background.
If any of the four evaulations concludes that site concentrations are shifted above background concentrations the final conclusion is that site concentrations are greater than background.
(7) There are less than three detected background concentrations. A meaningfull hypothesis tests could not be computed final conclusion based on comparison of maximum detected and maximum nondetected concentration.

Abbreviations:
FOD = Frequency of Detection
NA = Not Applicable
WRS = Wilcoxon Rank Sum Test

TABLE 3
COMBINED SURFACE AND SUBUSRFACE SOIL BACKGROUND COMPARISONS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE

Parameter	Background FOD	Site FOD	Total FOD	Background Maximum Detected Concentration(1)	Background Maximum Nondetect Concentration(1)	Site Maximum Detected Concentration(1)	Site Maximum NonDetect Concentration(1)	Graphical Display Comparison(2)	Site Distribution	Background Distribution	Hypothesis Test	Hypothesis Test Pvalue	Hypothesis Test Conclusion(2)	Number Site concentrations Greater than Background	Slippage Test(3,4)	Number Site that are in the 8 Largest Concentrations	Quantile Test(3,5)	Final Conclusion(6)
INORGANICS																		
ANTIMONY	2 / 25	28 / 57	30 / 82	9.4	10.2	3.7	1.1	Less	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Within Background
LEAD	25 / 25	57 / 57	82 / 82	1100	--	3697	--	Similar	Nonparametric	Nonparametric	WRS	4.20E-07	Less	2	Less	6	Less	Site Within Background
MERCURY	6 / 25	53 / 57	59 / 82	1.8	0.31	8.2	0.025	Similar	Nonparametric	Nonparametric	Gehan	0.481	Greater	3	Less	7	Less	**Site Greater Background**
PAHS																		
2-METHYLNAPHTHALENE	1 / 25	11 / 28	12 / 53	44	430	560000	4	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
CHRYSENE	20 / 25	47 / 57	67 / 82	1600	400	420000	3.8	Greater	Nonparametric	Nonparametric	Gehan	2.00E-06	Less	10	Greater	8	Greater	Site Greater Background
ACENAPHTHENE	0 / 25	33 / 57	33 / 82	--	430	100000	4	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
ACENAPHTHYLENE	1 / 25	40 / 57	41 / 82	74	430	370000	4	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
ANTHRACENE	2 / 25	42 / 57	44 / 82	62	430	290000	3.8	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
BENZO(A)ANTHRACENE	15 / 25	47 / 57	62 / 82	640	400	410000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.301	Greater	15	Greater	8	Greater	Site Greater Background
BENZO(A)PYRENE	15 / 25	47 / 57	62 / 82	1100	400	450000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.0902	Greater	12	Greater	8	Greater	Site Greater Background
BENZO(B)FLUORANTHENE	18 / 25	48 / 57	66 / 82	1700	400	360000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.0125	Less	11	Greater	8	Greater	Site Greater Background
BENZO(G,H,I)PERYLENE	7 / 25	48 / 57	55 / 82	410	410	230000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.651	Greater	13	Greater	8	Greater	Site Greater Background
BENZO(K)FLUORANTHENE	9 / 25	46 / 57	55 / 82	1100	430	130000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.295	Greater	11	Greater	8	Greater	Site Greater Background
DIBENZO(A,H)ANTHRACENE	2 / 25	40 / 57	42 / 82	190	430	66000	4	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
FLUORANTHENE	20 / 25	52 / 57	72 / 82	1700	390	550000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.0487	Less	11	Greater	8	Greater	Site Greater Background
FLUORENE	1 / 25	38 / 57	39 / 82	42	430	320000	4	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
INDENO(1,2,3-CD)PYRENE	8 / 25	45 / 57	53 / 82	440	410	160000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.546	Greater	13	Greater	8	Greater	Site Greater Background
NAPHTHALENE	2 / 25	38 / 57	40 / 82	43	430	640000	4	Greater	Nonparametric	Assumed Nonparametric	No Hypothesis Test(7)	NA	NA	NA	NA	NA	NA	Site Greater Background
PHENANTHRENE	14 / 25	51 / 57	65 / 82	470	400	1300000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.572	Greater	16	Greater	8	Greater	Site Greater Background
PYRENE	21 / 25	52 / 57	73 / 82	1400	390	910000	3.8	Greater	Nonparametric	Nonparametric	Gehan	0.0373	Less	12	Greater	8	Greater	Site Greater Background

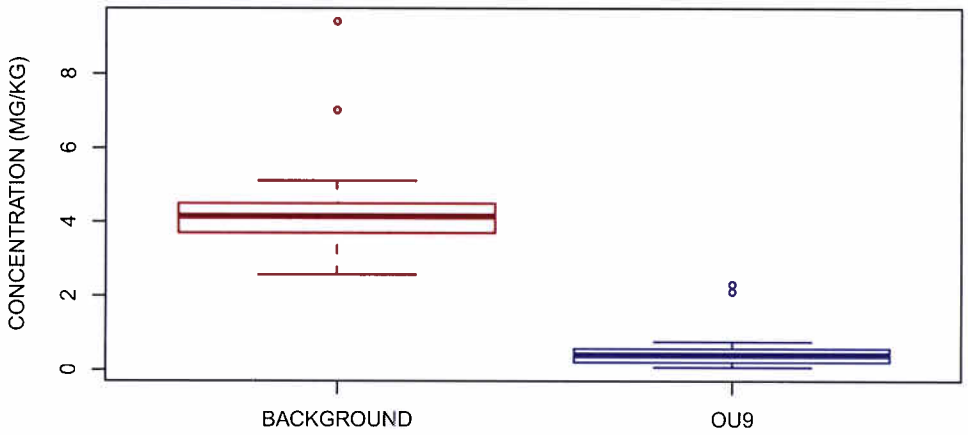
Notes:
(1) Units for inorganics are mg/kg. Units for PAHs are ug/kg.
(2) For the background comparisons the following codes were used:
Less = Site concentrations are shifted below background.
Similar = Site concentrations are similar to background.
Greater = Site concentrations are shifted above background.
(3) Shapiro Wilks test with a significance level of 0.05 was used to determine distribution.
(4) Slippage test was conducted at 0.05 significance level and concluded that the site concentrations are shifted above background if more than 8 site concentrations are greater than the maximum background concentration.
Critical values for the Slippage test were obtained from Table C-3 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.
(5) Quantile test was conducted at 0.05 significance level and concluded that site was greater than background if 8 of the 8 largest concentrations are from the site dataset.
Critical values for the Quantile test were obtained from Table C-6 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.
(6) If the graphical evaluation and all three statistical tests conclude that the site data set concentrations are shifted below background the final conclusion is that site is within background.
If any of the four evaulations concludes that site concentrations are shifted above background concentrations the final conclusion is that site concentrations are greater than background.
(7) There are less than three detected background concentrations. A meaningfull hypothesis tests could not be computed final conclusion based on comparison of maximum detected and maximum nondetected concentration.

Abbreviations:
FOD = Frequency of Detection
NA = Not Applicable
WRS = Wilcoxon Rank Sum Test

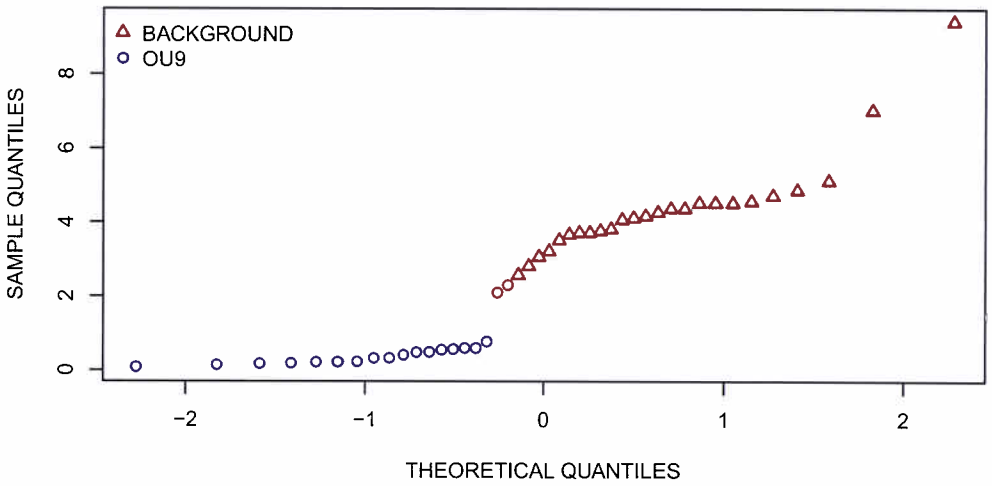
SURFACE SOIL GRAPHICAL DISPLAYS

ANTIMONY SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 1 OF 20

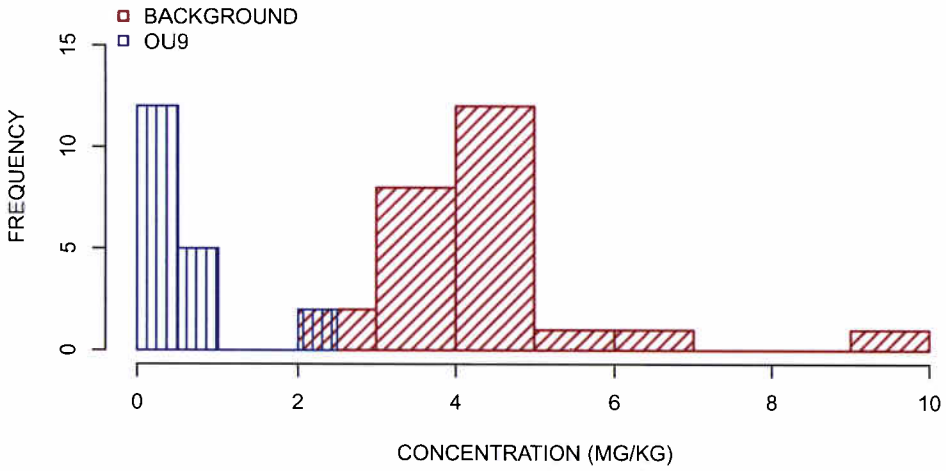
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	2.6	0.075
25TH PERCENTILE	3.7	0.22
MEDIAN	4.2	0.41
MEAN	4.3	0.57
75TH PERCENTILE	4.5	0.58
MAXIMUM	9.4	2.3

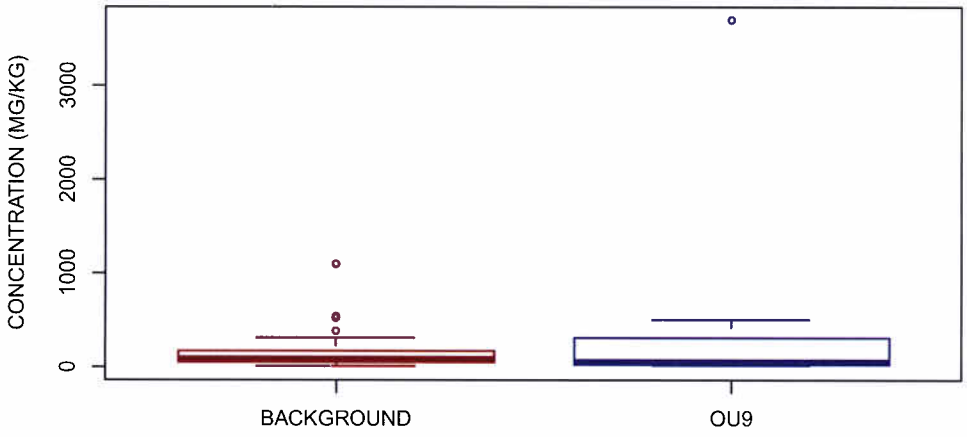
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

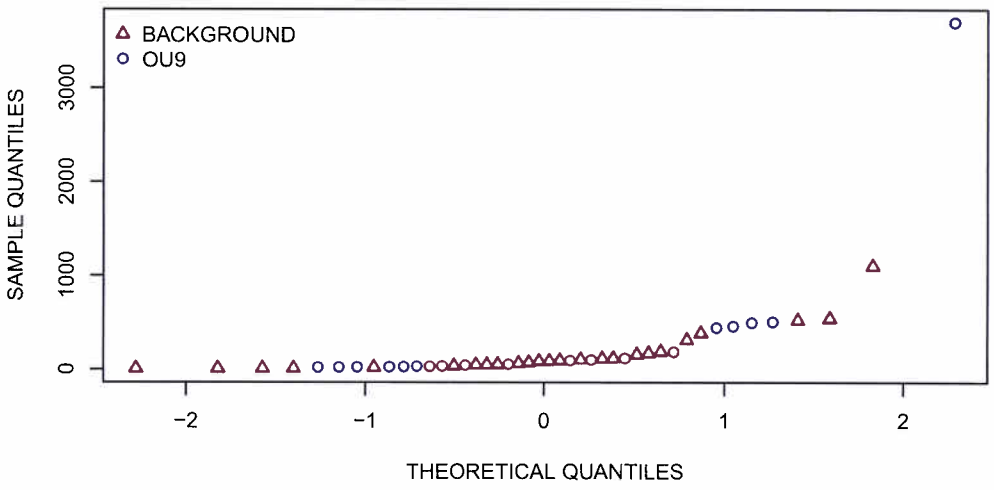
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 2 OF 20

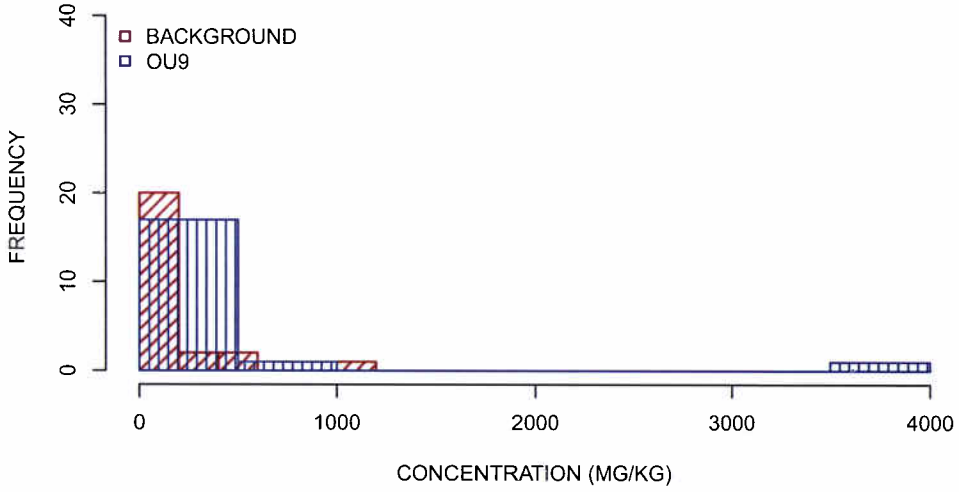
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	9.5	19
25TH PERCENTILE	51	27
MEDIAN	90	60
MEAN	180	340
75TH PERCENTILE	170	320
MAXIMUM	1100	3700

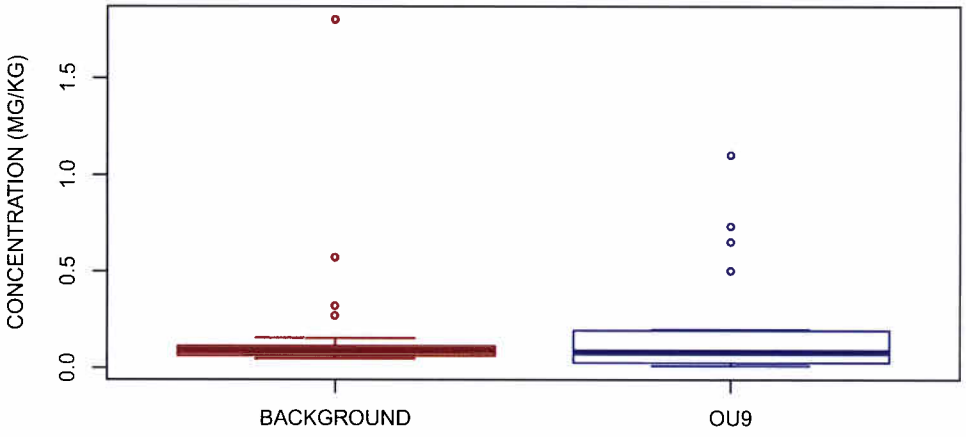
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

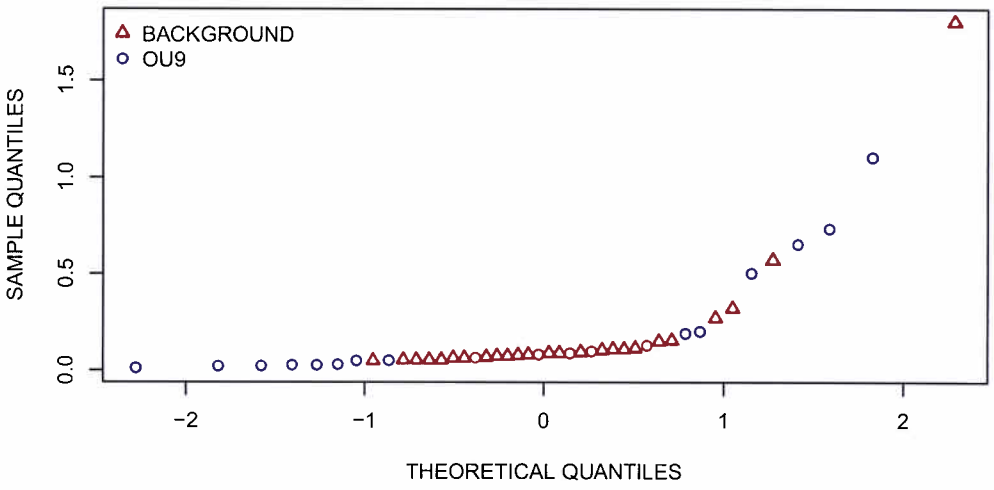
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 3 OF 20

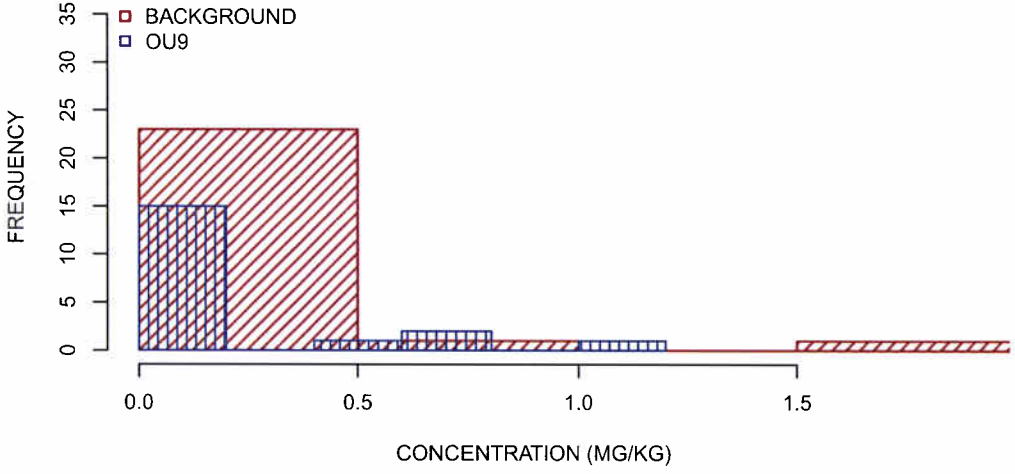
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	0.05	0.011
25TH PERCENTILE	0.065	0.029
MEDIAN	0.09	0.083
MEAN	0.19	0.21
75TH PERCENTILE	0.12	0.2
MAXIMUM	1.8	1.1

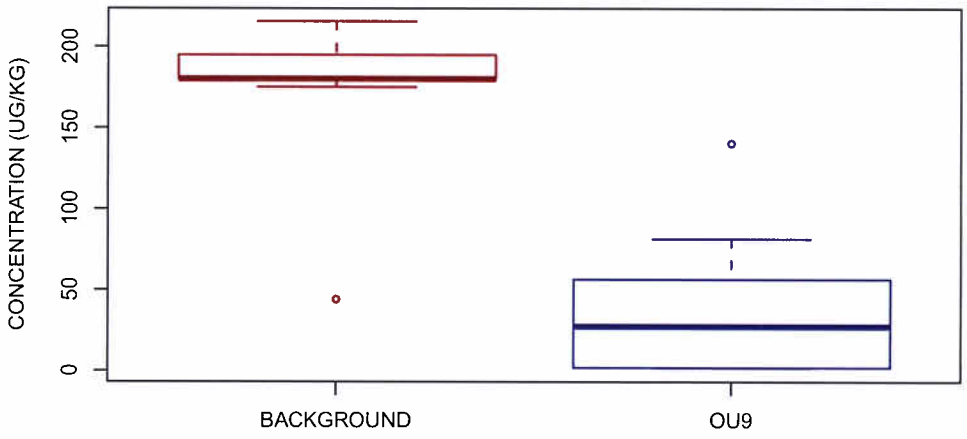
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

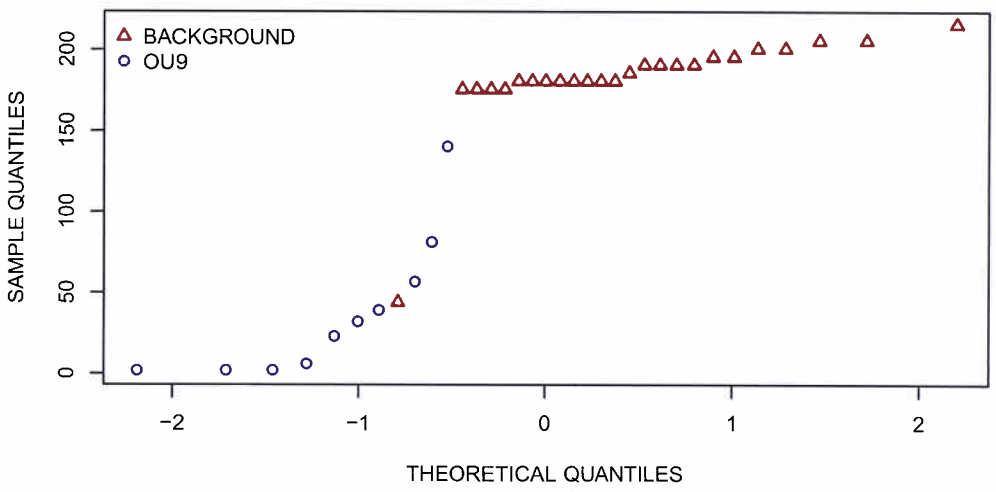
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

2-METHYLNAPHTHALENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 4 OF 20

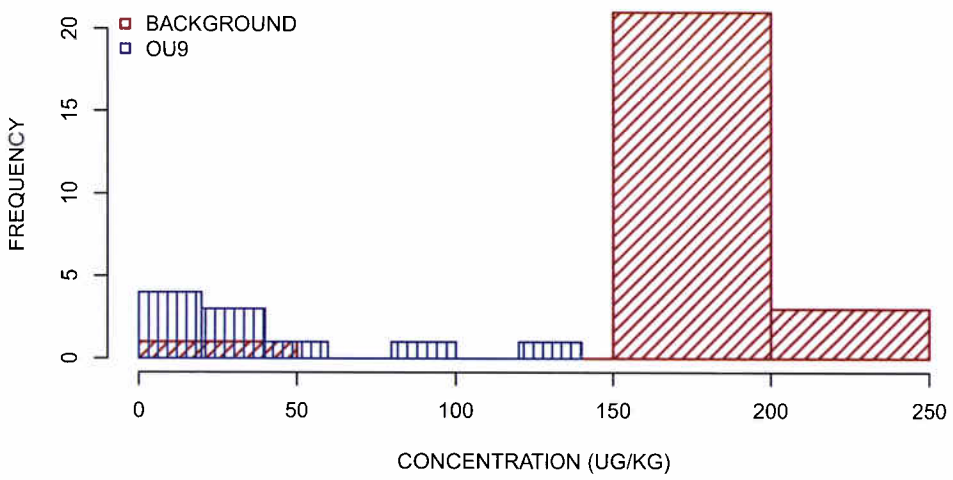
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



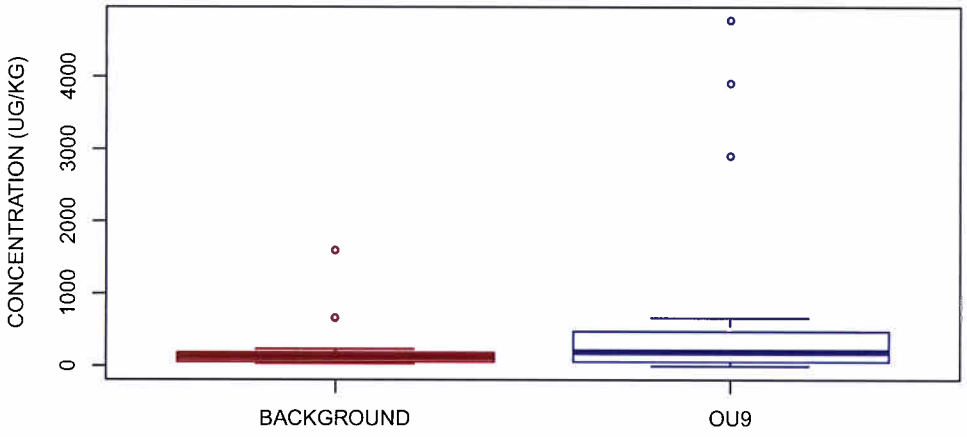
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	44	1.8
25TH PERCENTILE	180	3
MEDIAN	180	28
MEAN	180	38
75TH PERCENTILE	200	52
MAXIMUM	220	140

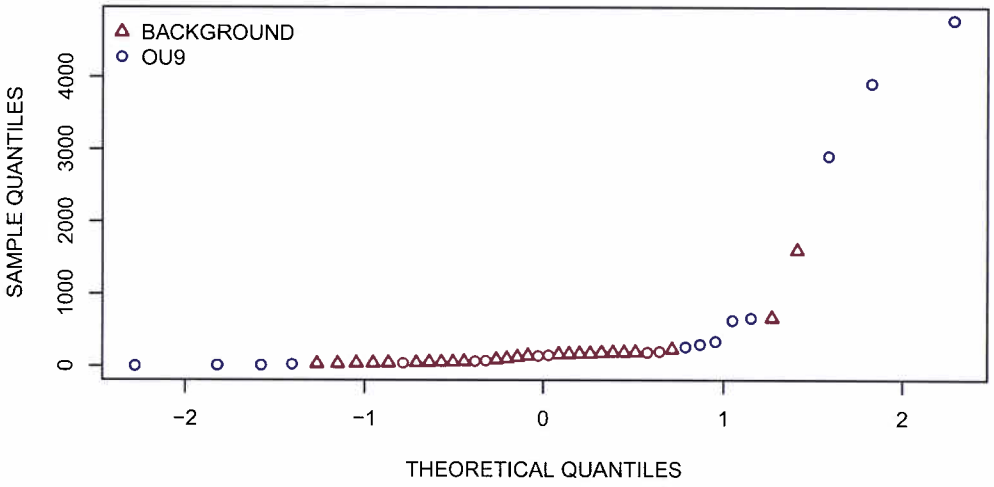
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHRYSENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 5 OF 20

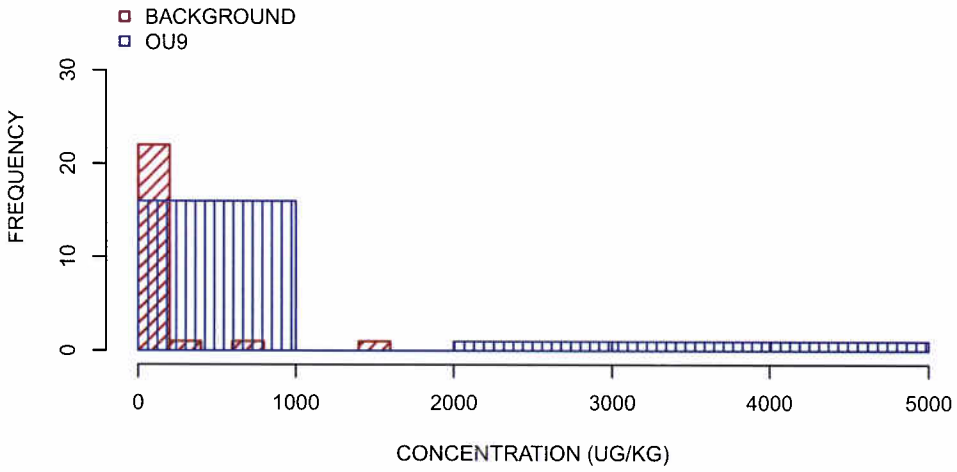
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	37	1.9
25TH PERCENTILE	61	64
MEDIAN	130	200
MEAN	200	780
75TH PERCENTILE	190	480
MAXIMUM	1600	4800

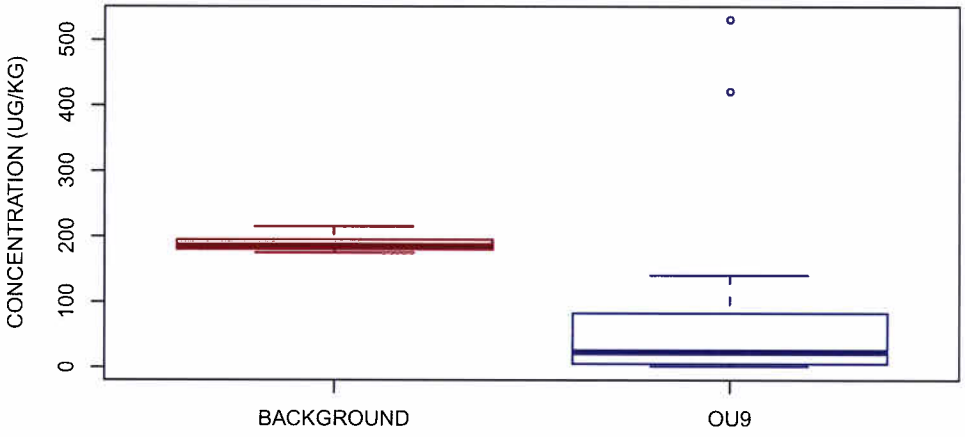
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

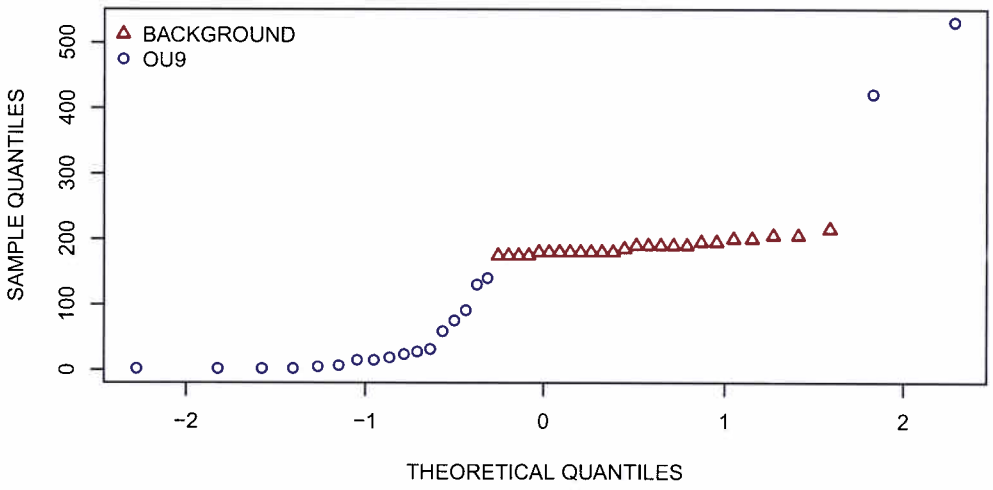
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ACENAPHTHENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 6 OF 20

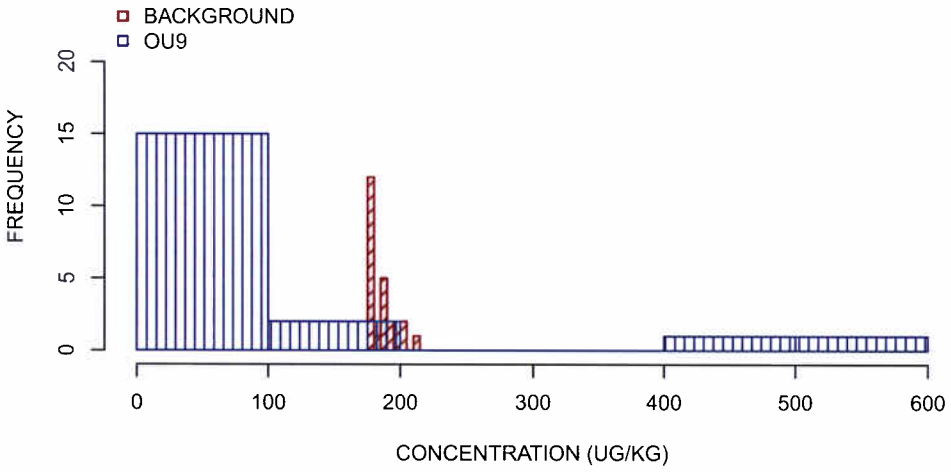
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	180	1.8
25TH PERCENTILE	180	5.7
MEDIAN	180	24
MEAN	190	84
75TH PERCENTILE	200	83
MAXIMUM	220	530

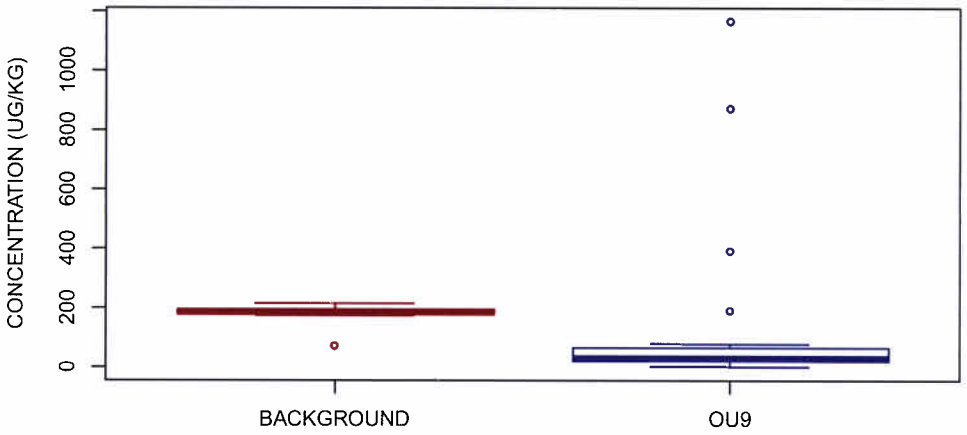
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

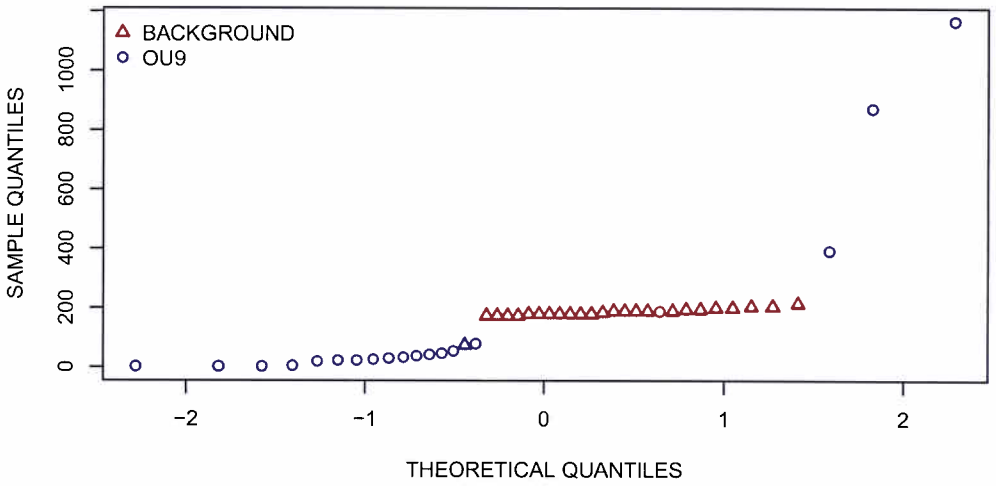
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ACENAPHTHYLENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 7 OF 20

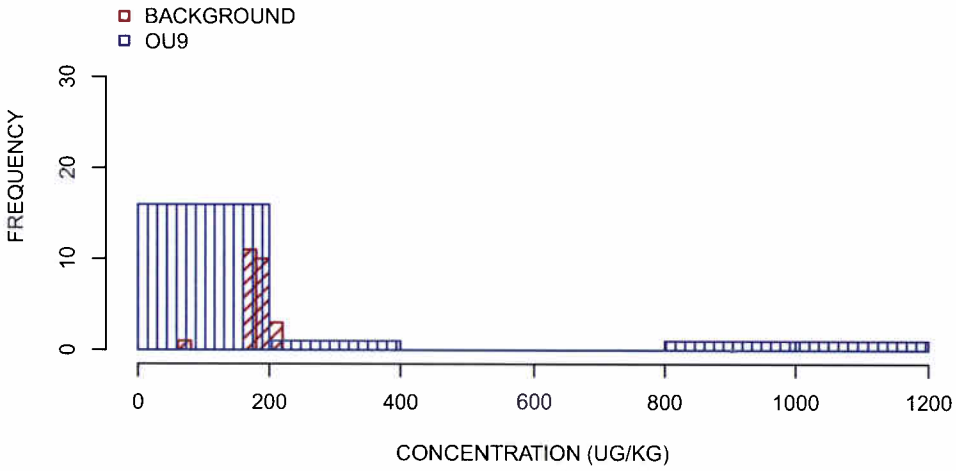
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	74	1.9
25TH PERCENTILE	180	22
MEDIAN	180	33
MEAN	180	160
75TH PERCENTILE	200	67
MAXIMUM	220	1200

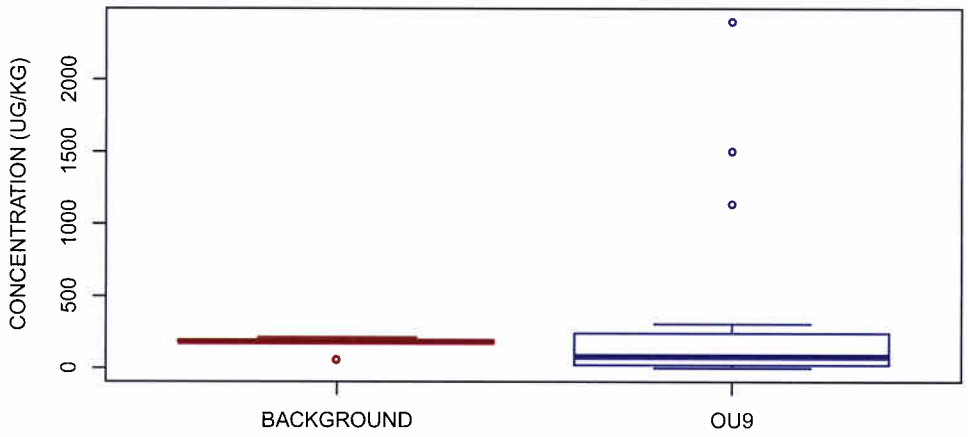
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

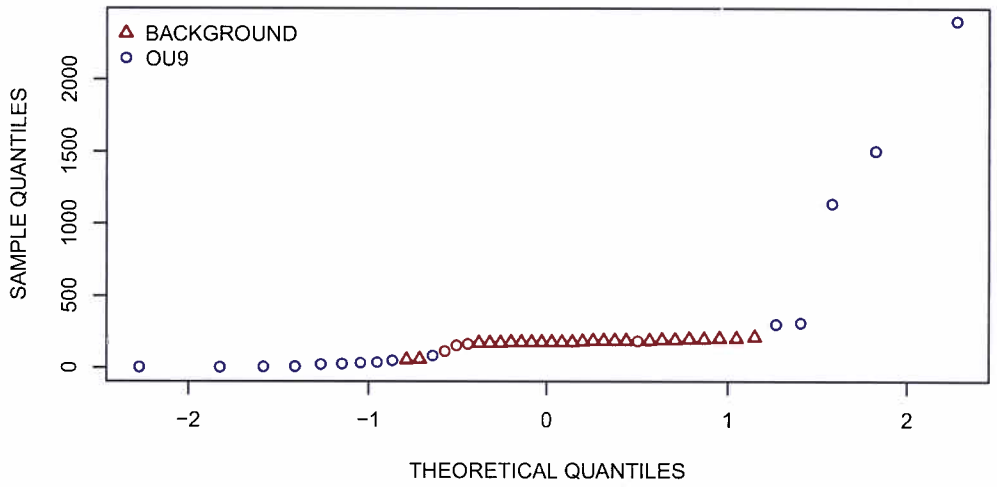
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ANTHRACENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 8 OF 20

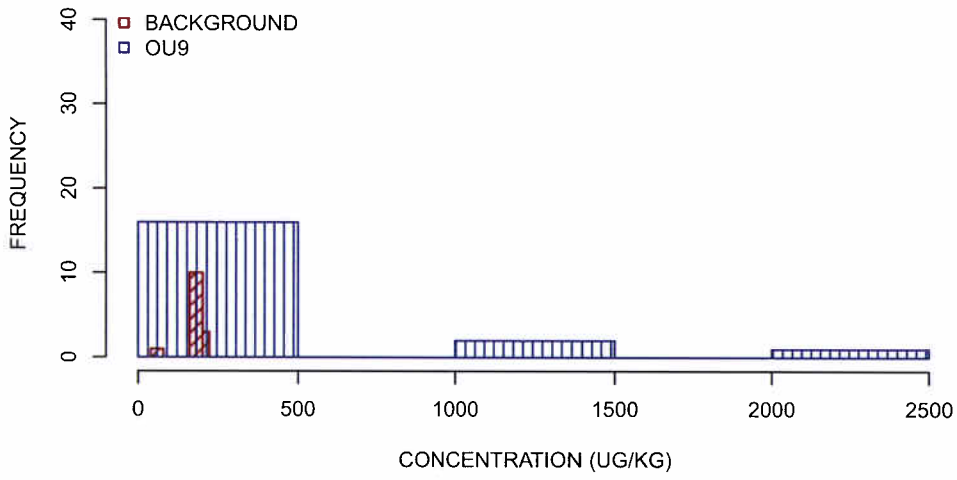
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



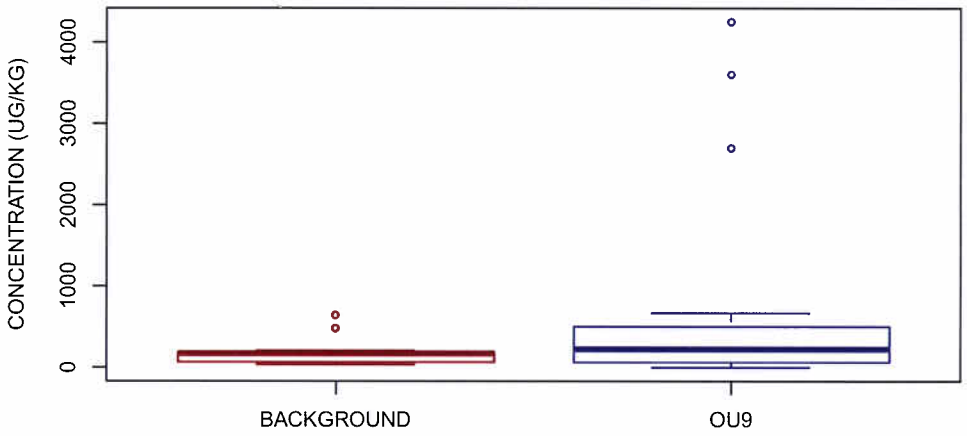
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	58	1.9
25TH PERCENTILE	180	24
MEDIAN	180	83
MEAN	180	340
75TH PERCENTILE	200	240
MAXIMUM	220	2400

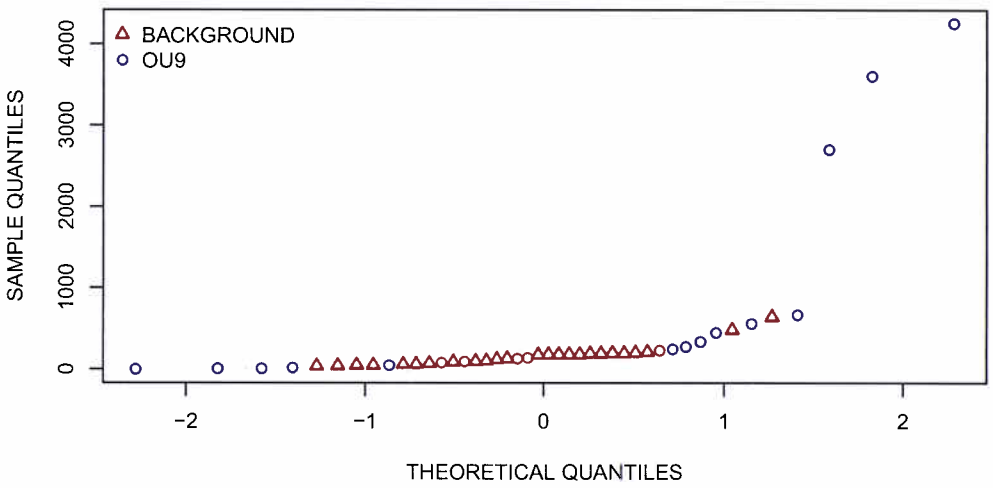
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(A)ANTHRACENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 9 OF 20

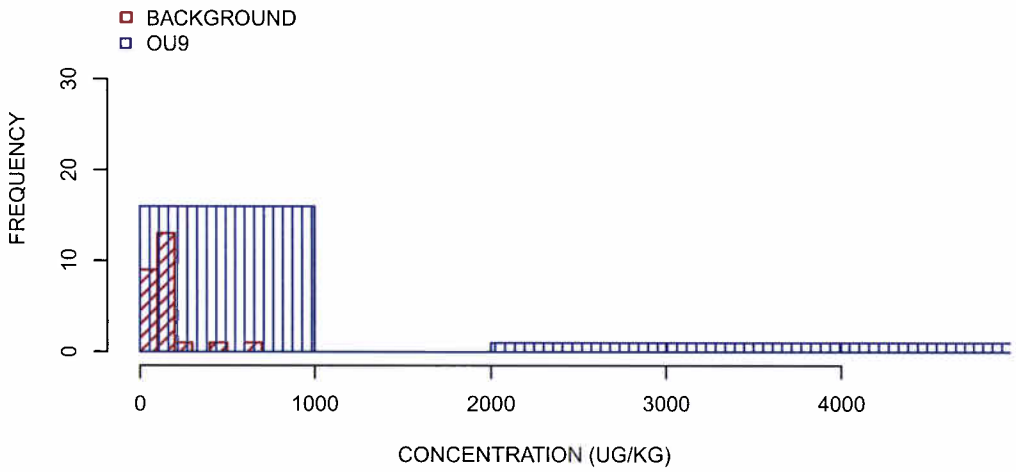
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



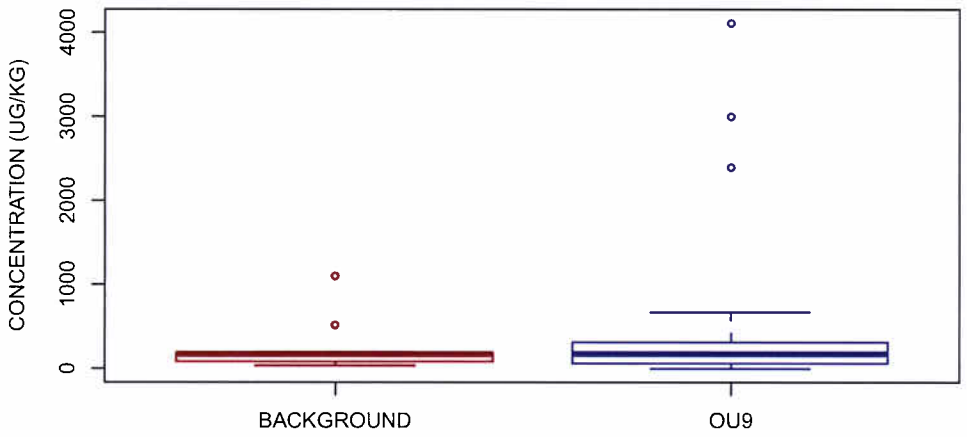
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	37	1.9
25TH PERCENTILE	69	67
MEDIAN	180	230
MEAN	160	730
75TH PERCENTILE	190	500
MAXIMUM	640	4200

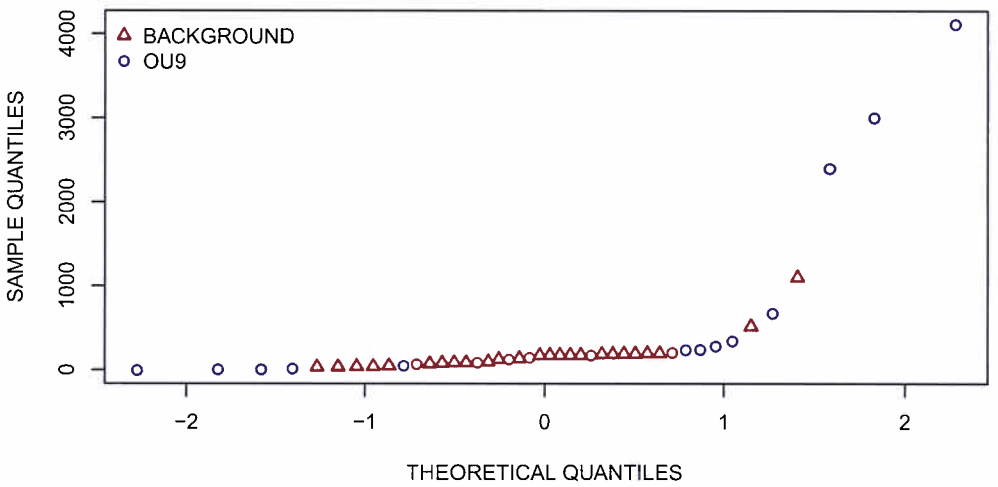
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(A)PYRENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 10 OF 20

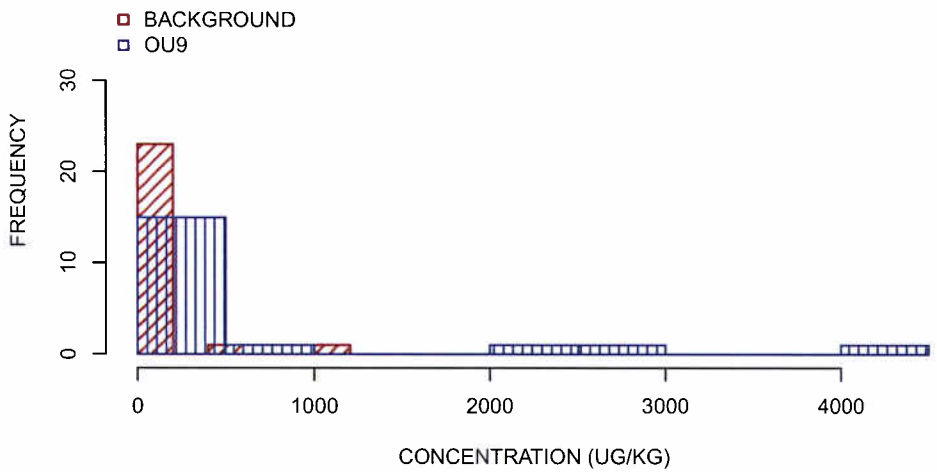
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	36	1.9
25TH PERCENTILE	85	64
MEDIAN	180	180
MEAN	180	650
75TH PERCENTILE	190	320
MAXIMUM	1100	4100

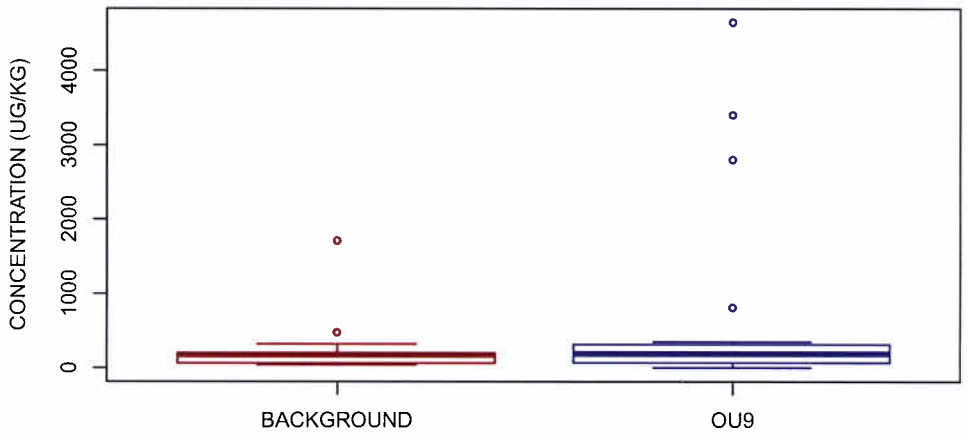
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

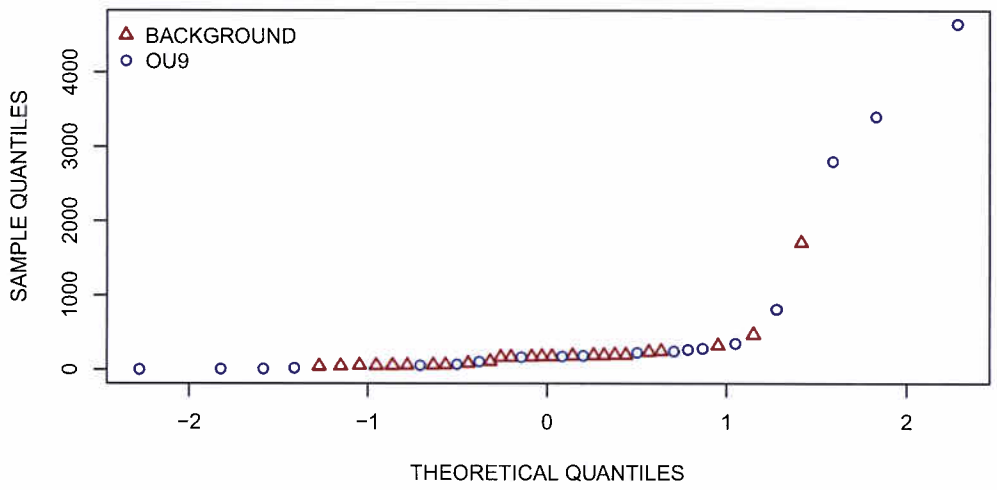
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(B)FLUORANTHENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 11 OF 20

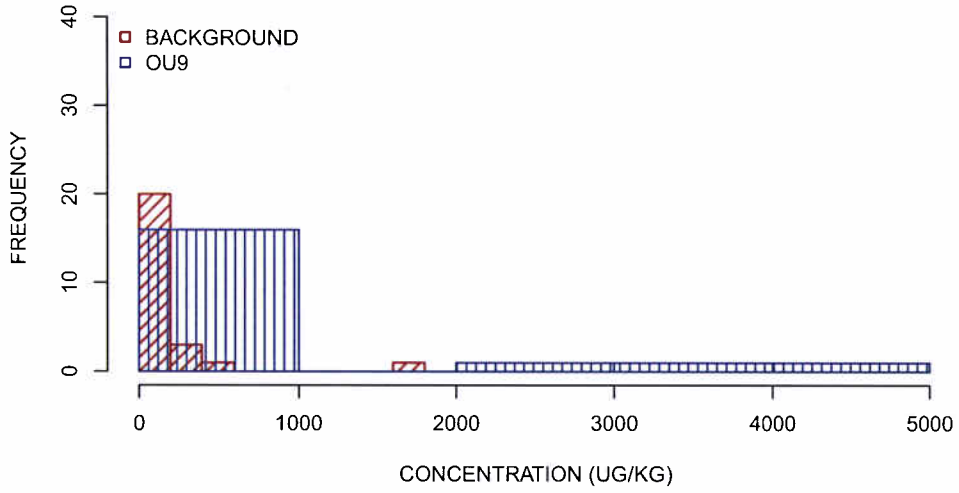
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



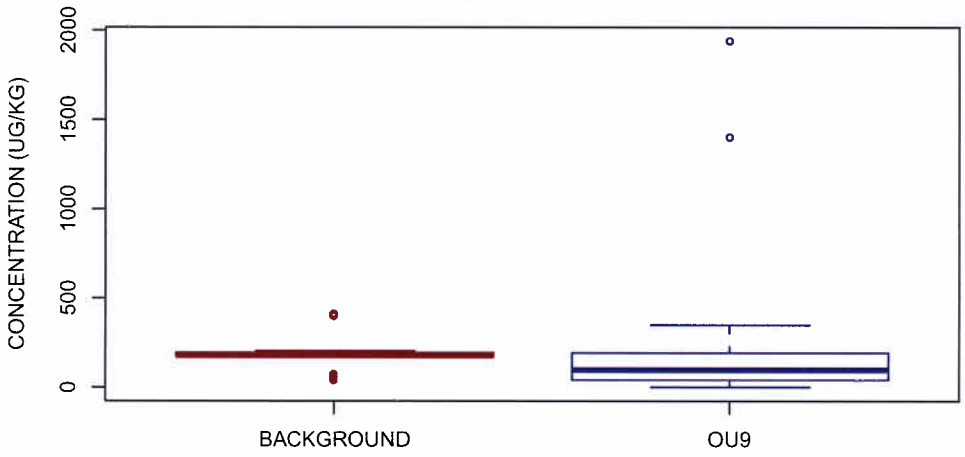
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	41	1.9
25TH PERCENTILE	62	68
MEDIAN	180	190
MEAN	220	730
75TH PERCENTILE	200	320
MAXIMUM	1700	4600

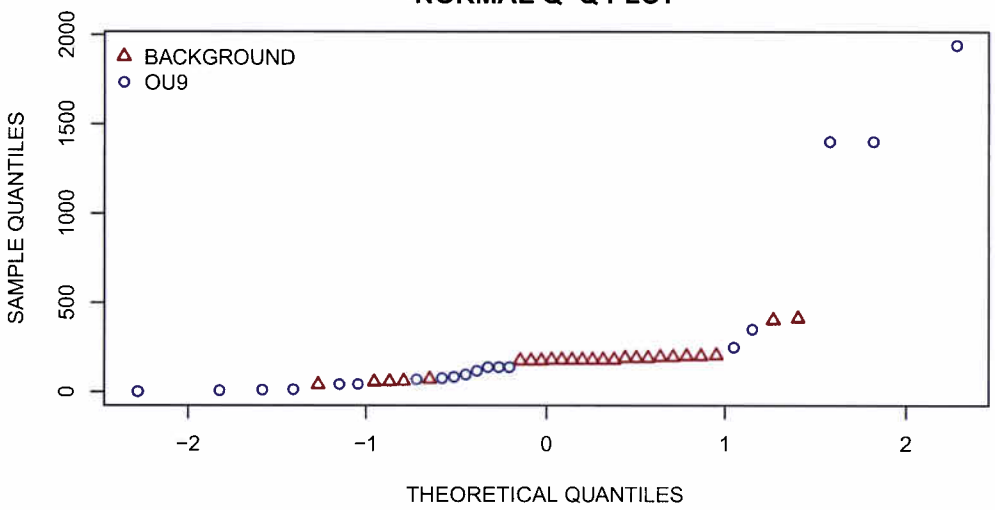
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(G,H,I)PERYLENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 12 OF 20

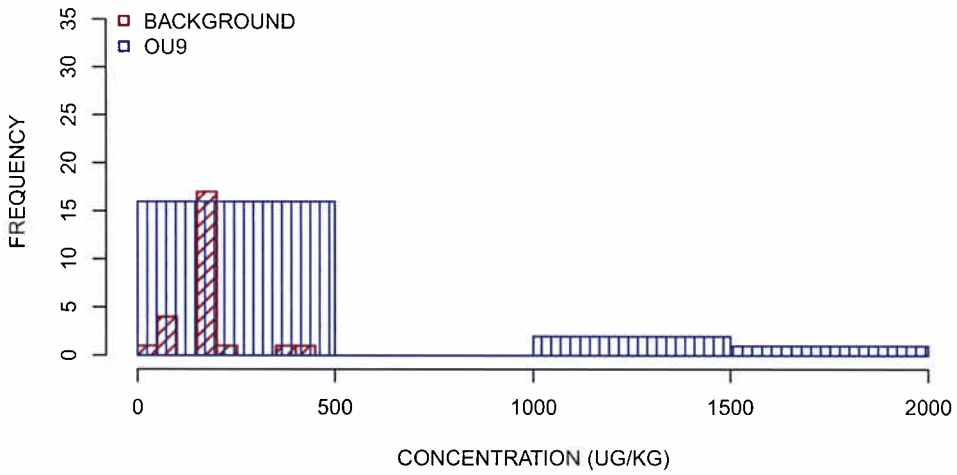
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



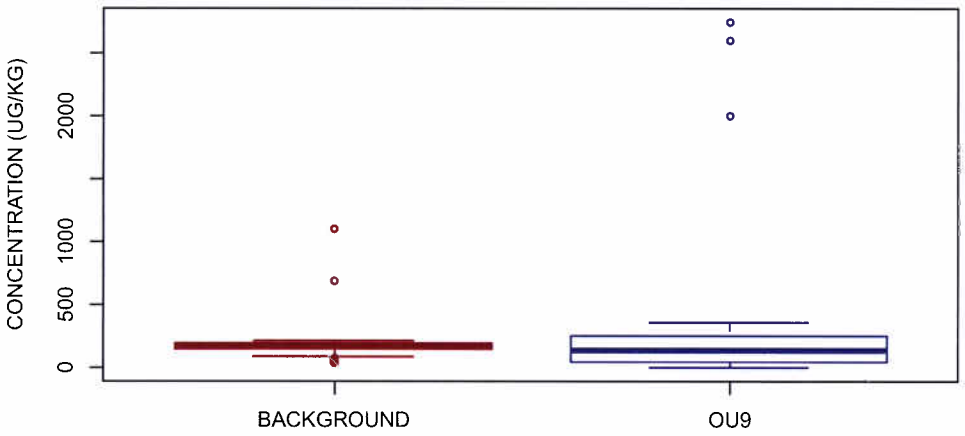
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	39	1.9
25TH PERCENTILE	180	44
MEDIAN	180	99
MEAN	180	330
75TH PERCENTILE	200	200
MAXIMUM	410	1900

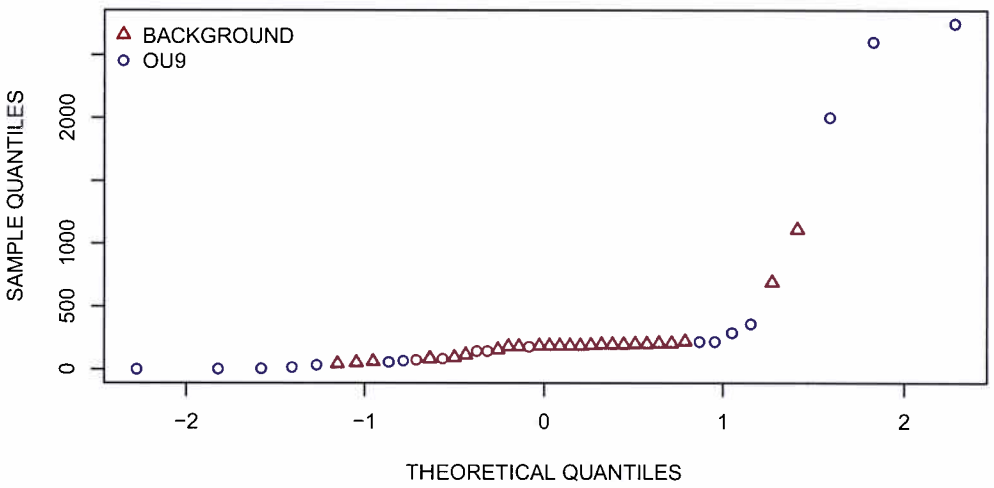
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(K)FLUORANTHENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 13 OF 20

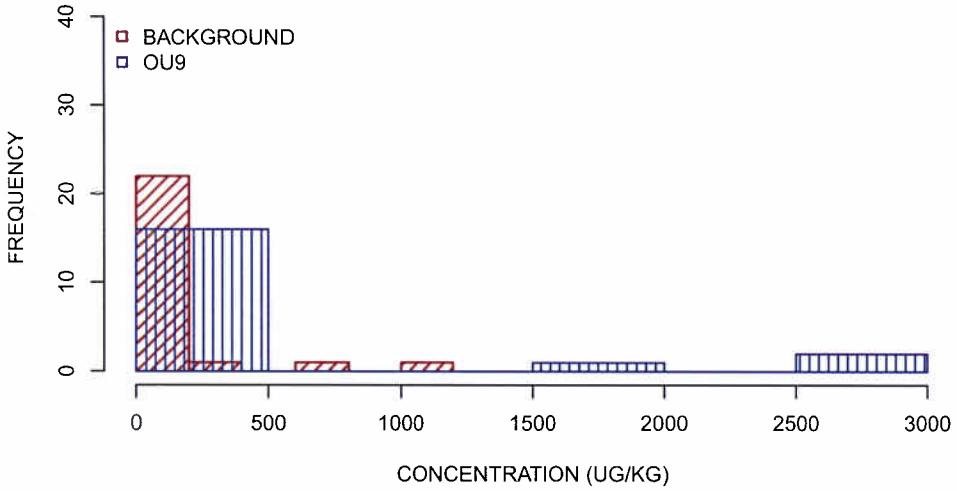
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



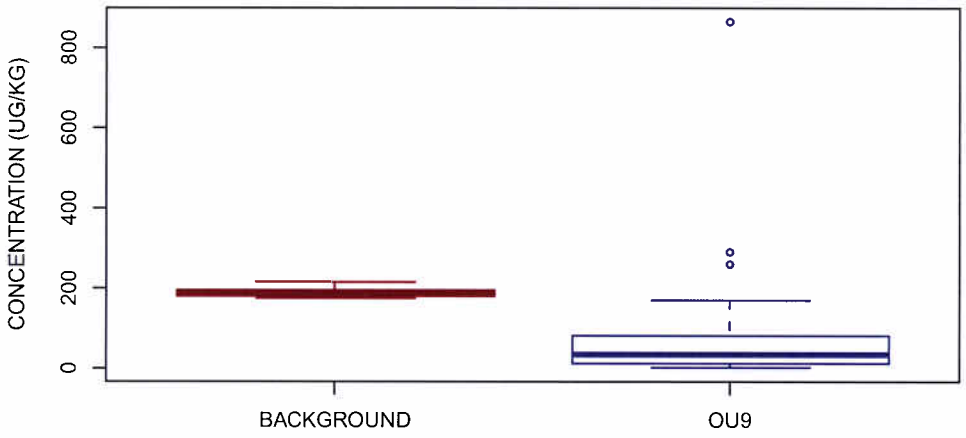
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	38	1.9
25TH PERCENTILE	150	48
MEDIAN	180	140
MEAN	210	490
75TH PERCENTILE	200	260
MAXIMUM	1100	2700

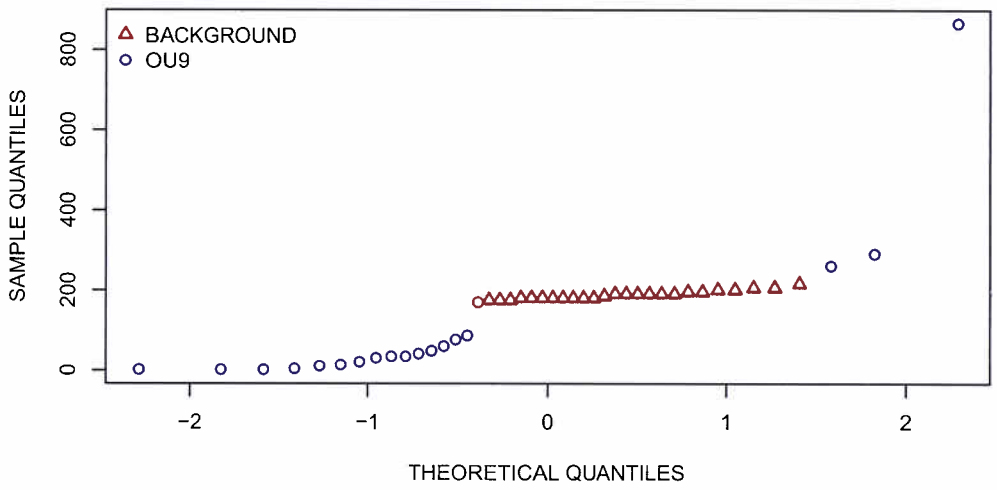
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

DIBENZO(A,H)ANTHRACENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 14 OF 20

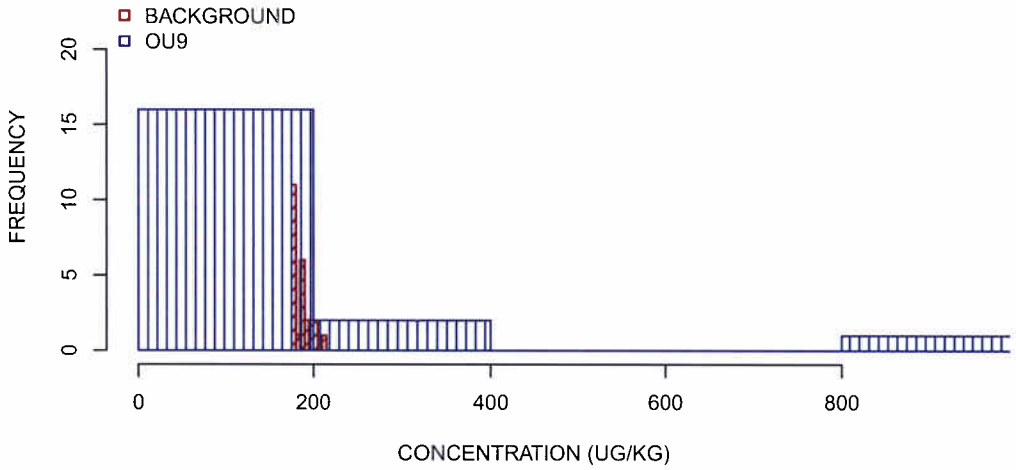
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



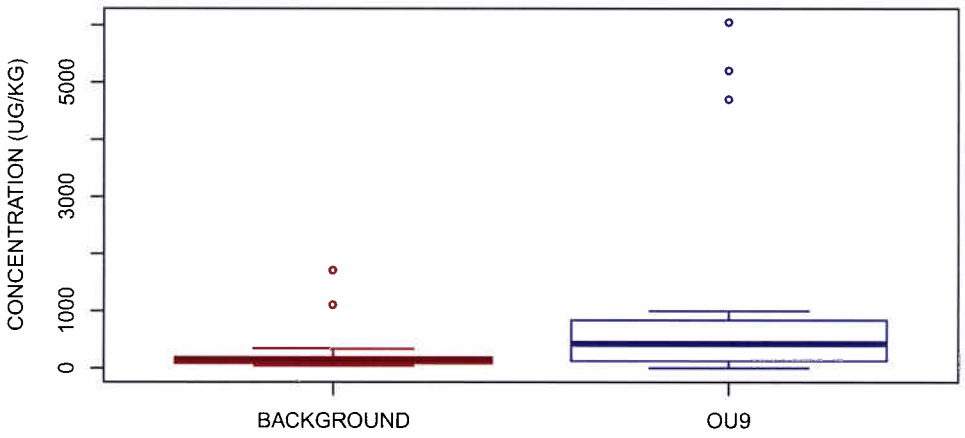
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	180	1.9
25TH PERCENTILE	180	12
MEDIAN	190	35
MEAN	190	110
75TH PERCENTILE	200	82
MAXIMUM	220	860

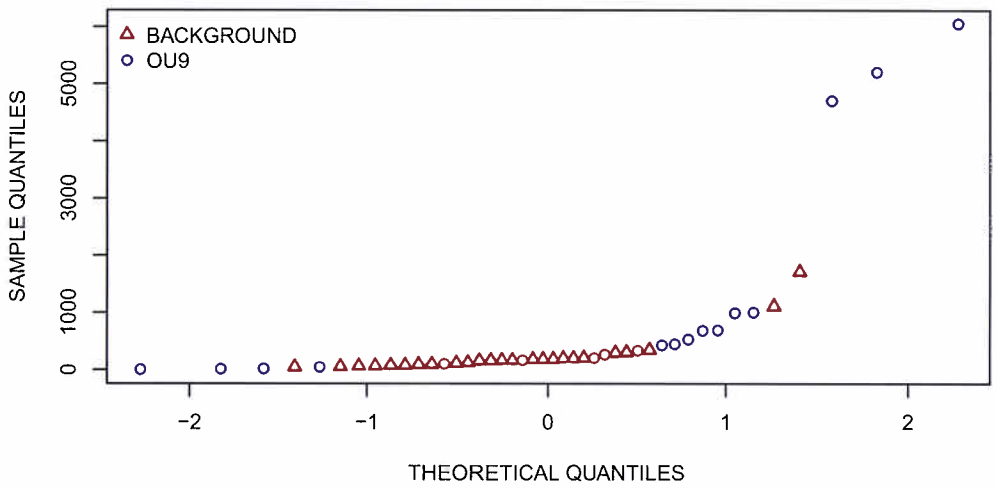
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

FLUORANTHENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 15 OF 20

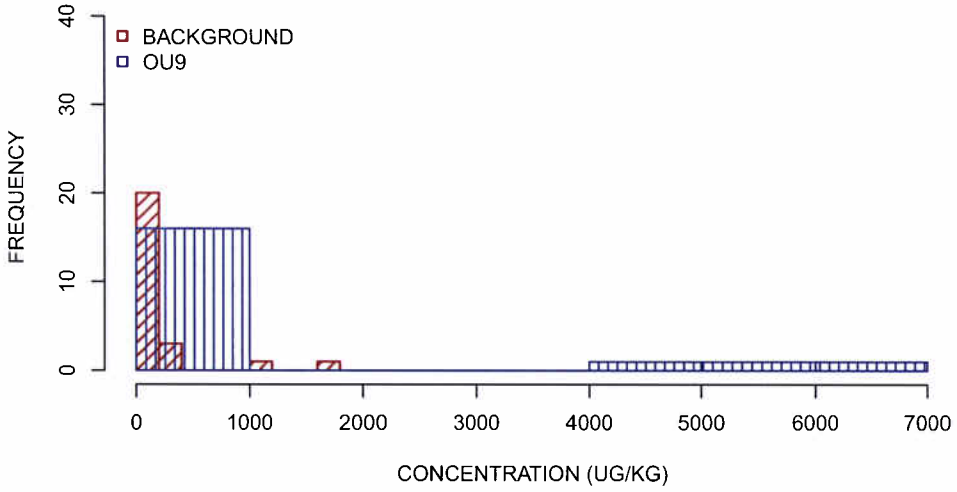
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	43	3
25TH PERCENTILE	86	130
MEDIAN	160	430
MEAN	250	1200
75TH PERCENTILE	200	840
MAXIMUM	1700	6000

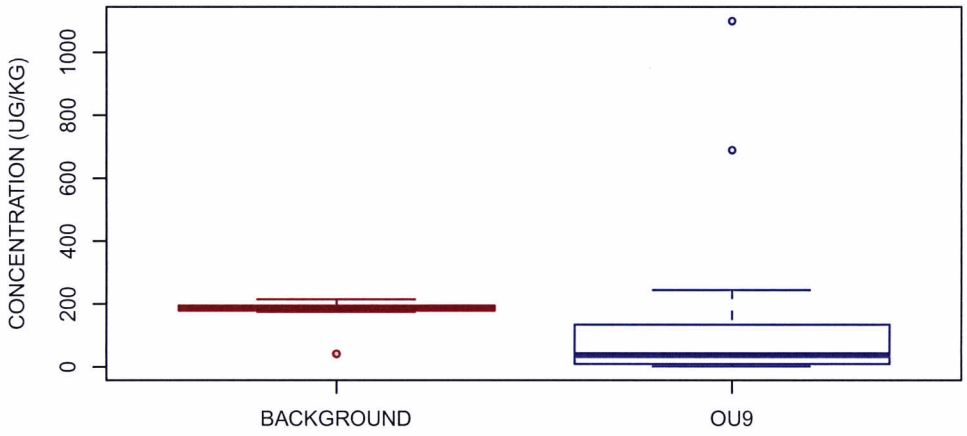
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

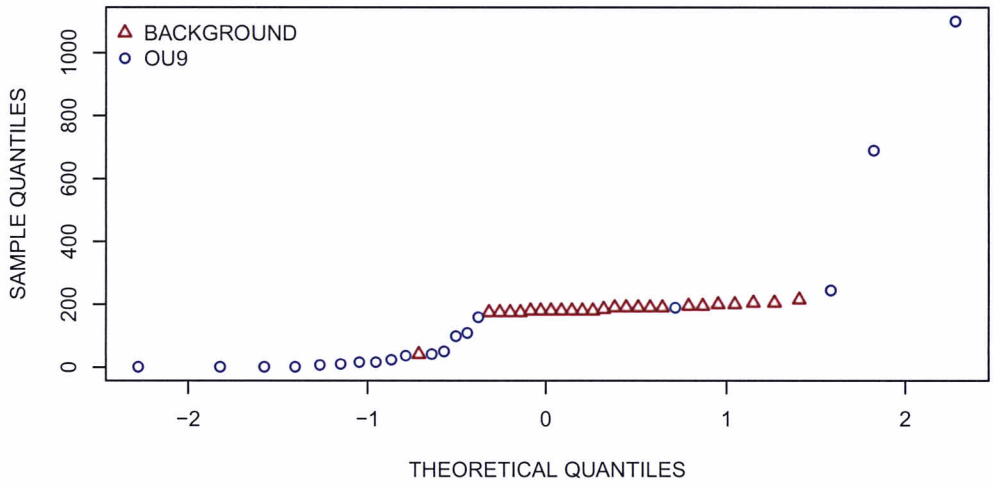
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

FLUORENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 16 OF 20

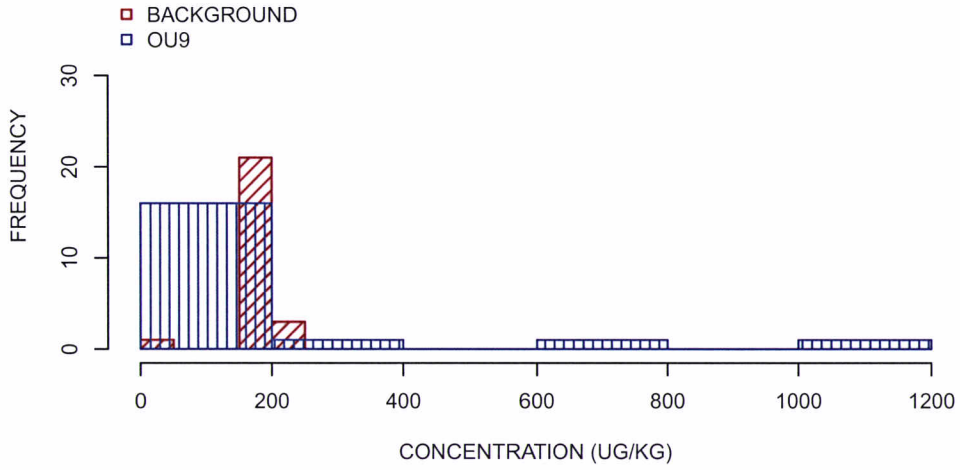
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	180	9.5
MEDIAN	180	38
MEAN	180	150
75TH PERCENTILE	200	140
MAXIMUM	220	1100

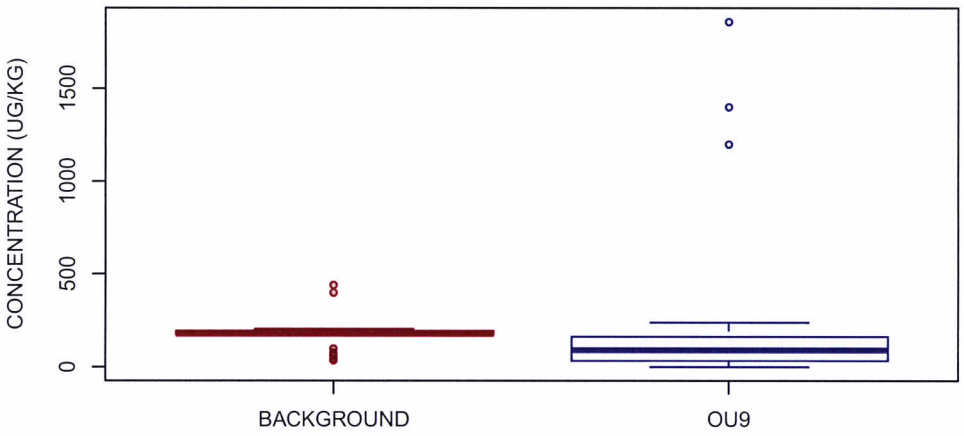
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

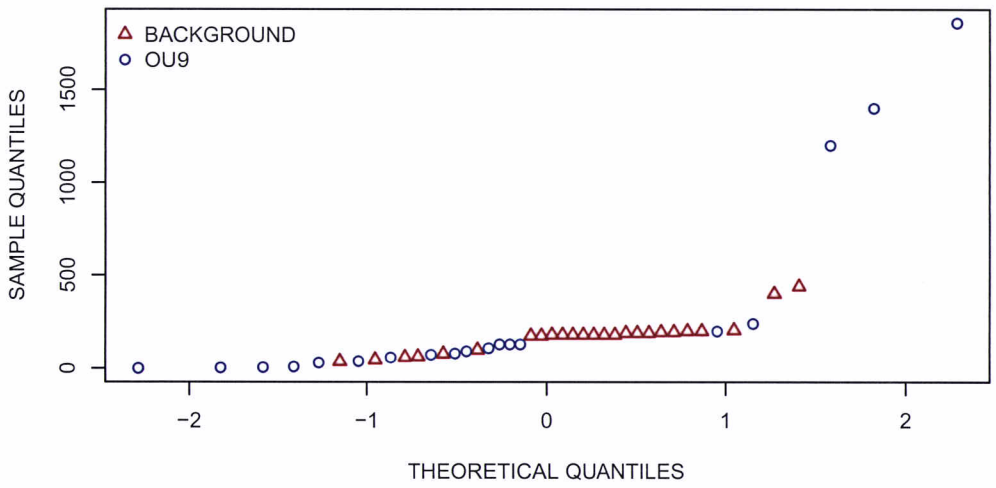
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

INDENO(1,2,3-CD)PYRENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 17 OF 20

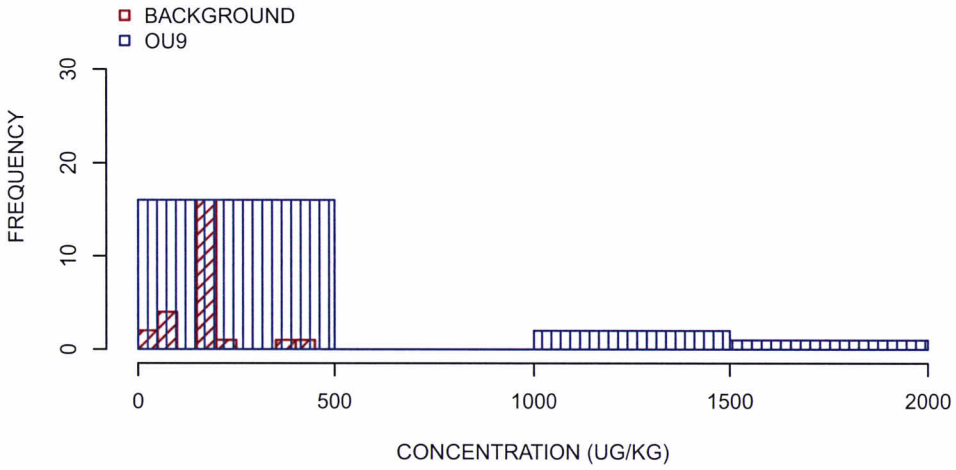
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



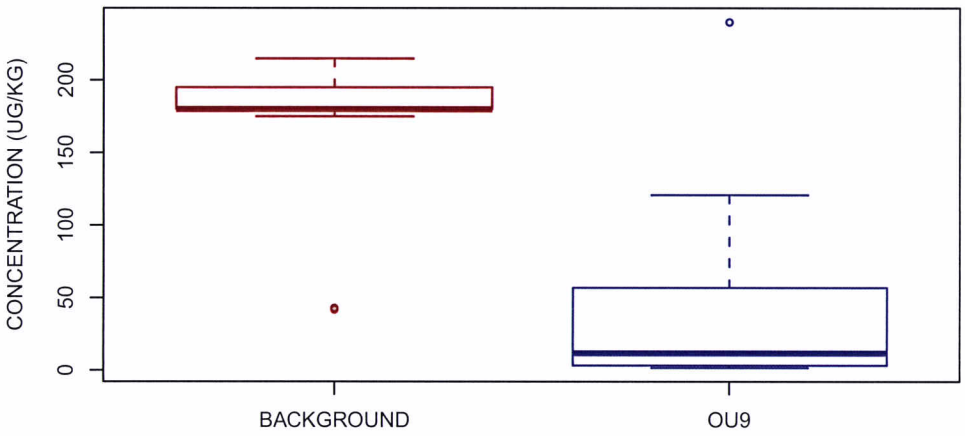
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	38	1.9
25TH PERCENTILE	180	36
MEDIAN	180	93
MEAN	180	310
75TH PERCENTILE	200	160
MAXIMUM	440	1900

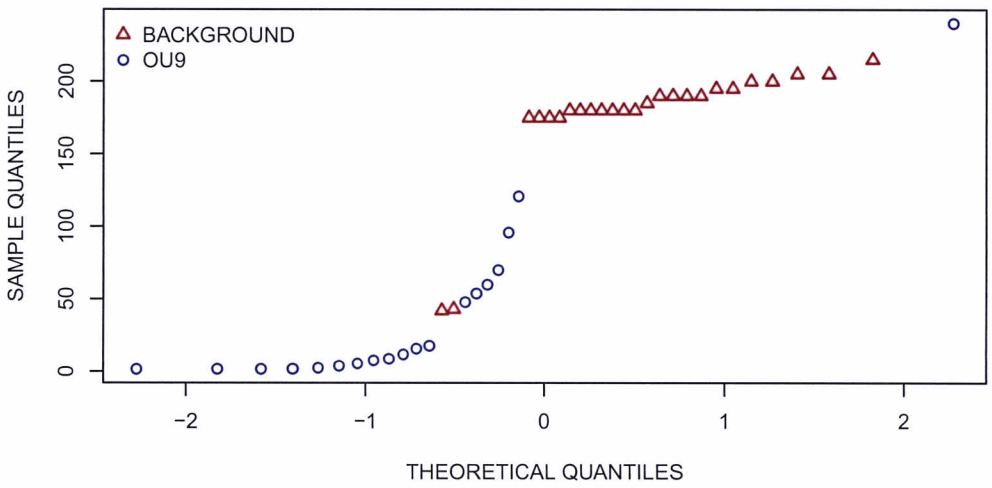
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

NAPHTHALENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 18 OF 20

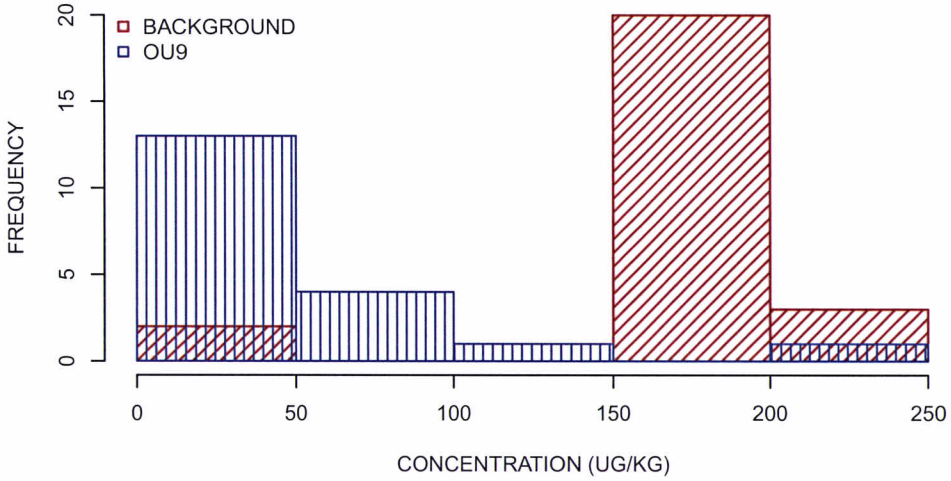
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	180	3.4
MEDIAN	180	12
MEAN	180	41
75TH PERCENTILE	200	57
MAXIMUM	220	240

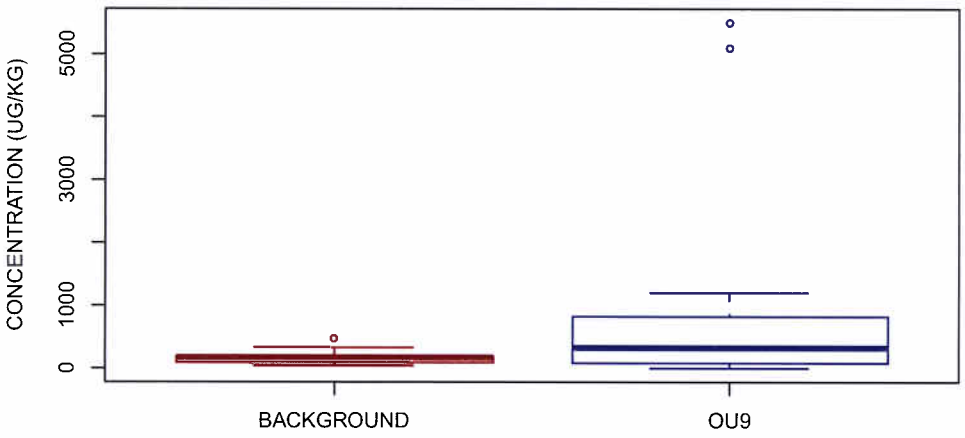
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

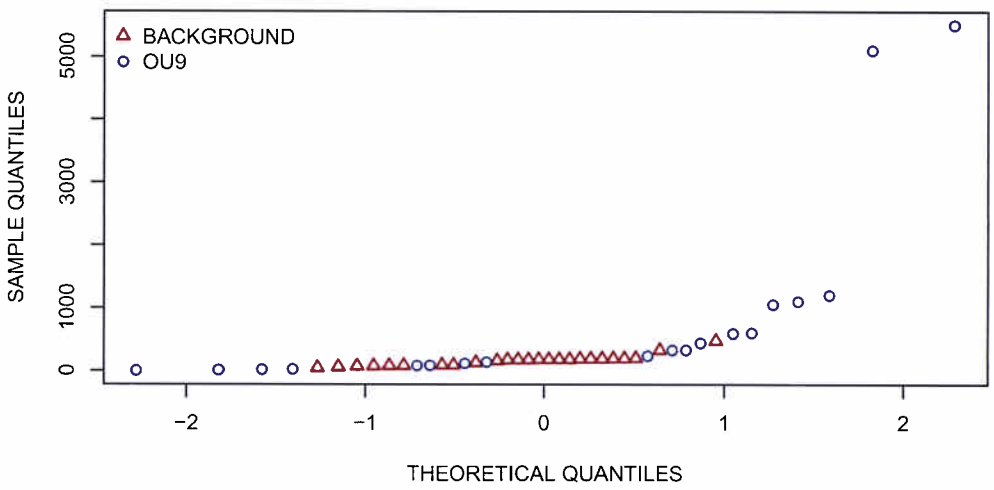
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

PHENANTHRENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 19 OF 20

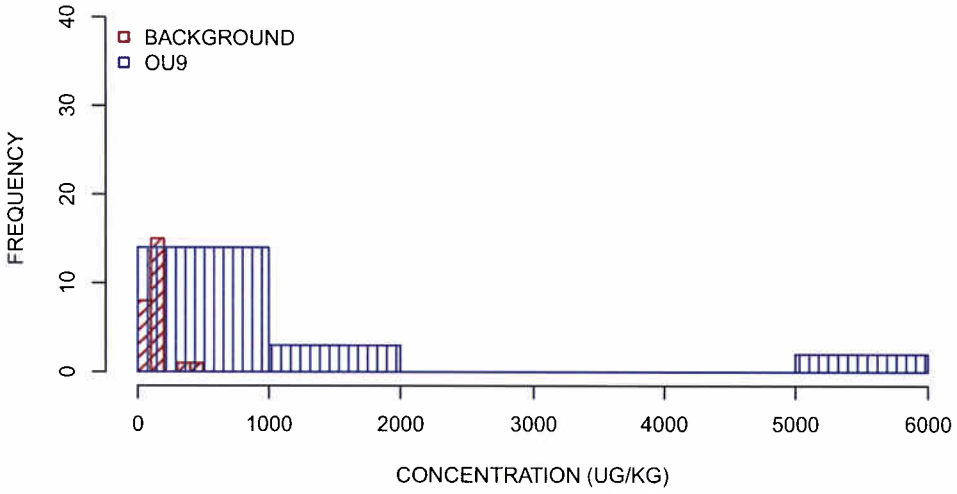
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	40	1.9
25TH PERCENTILE	91	85
MEDIAN	180	330
MEAN	160	890
75TH PERCENTILE	190	820
MAXIMUM	470	5500

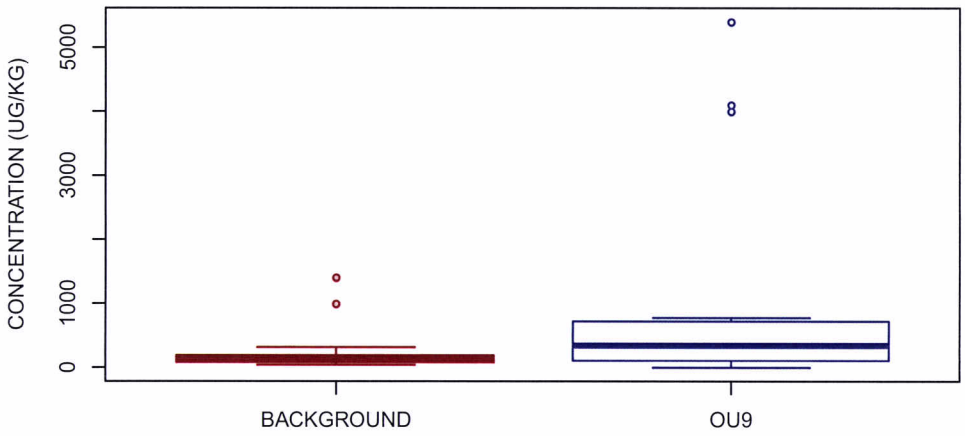
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

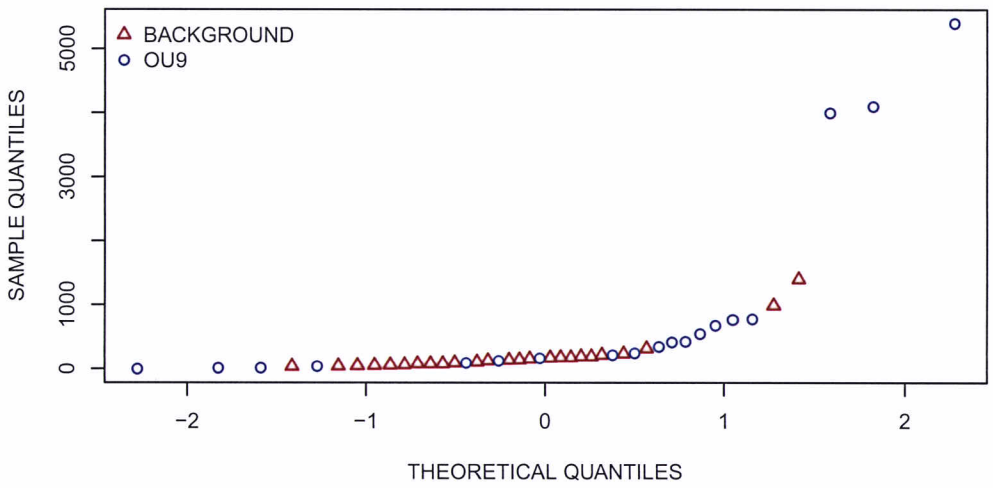
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

PYRENE SURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 20 OF 20

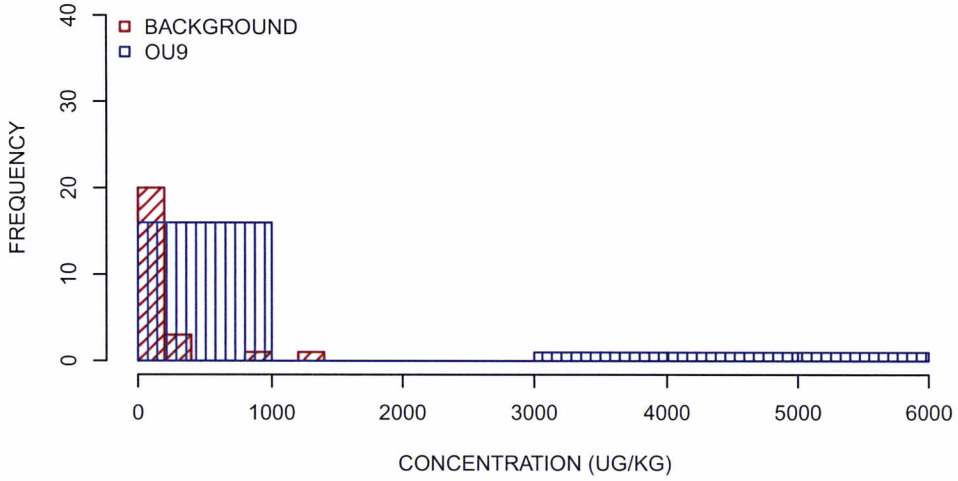
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

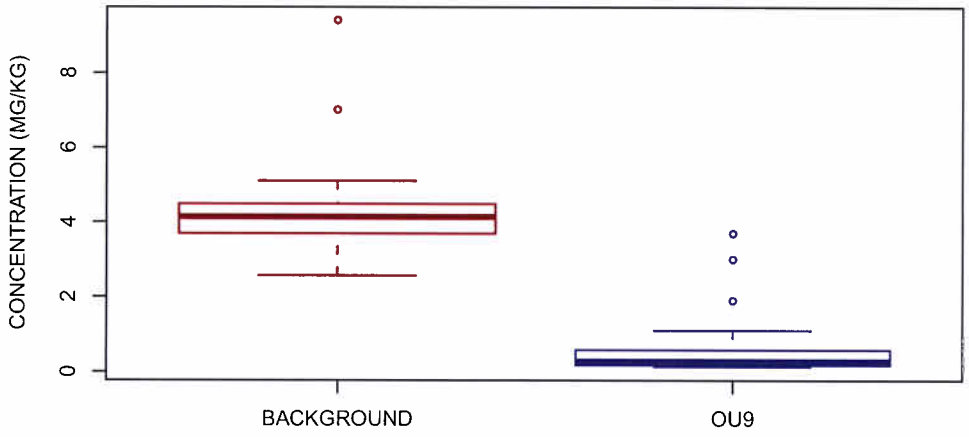
	BACKGROUND	OU9
MINIMUM	42	2.2
25TH PERCENTILE	83	110
MEDIAN	140	350
MEAN	220	970
75TH PERCENTILE	200	720
MAXIMUM	1400	5400

UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

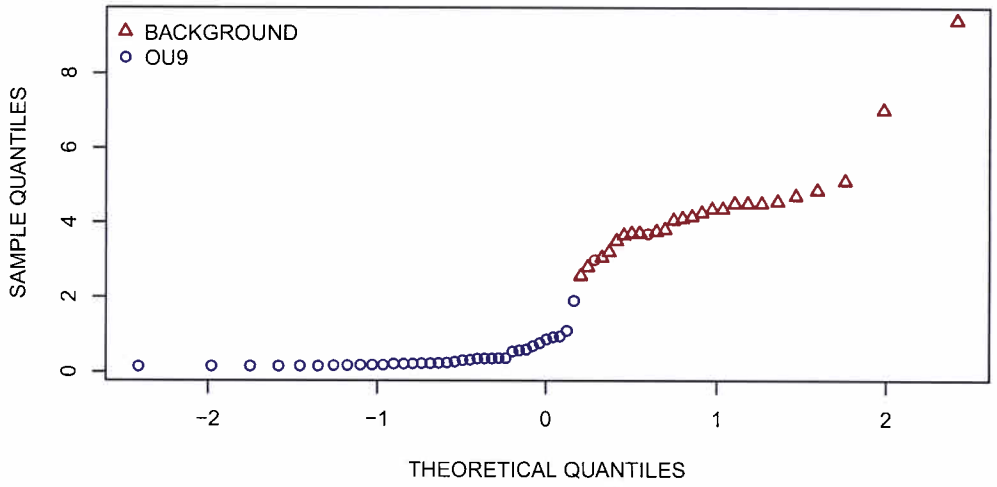
SUBSURFACE SOIL GRAPHICAL DISPLAYS

ANTIMONY SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 1 OF 20

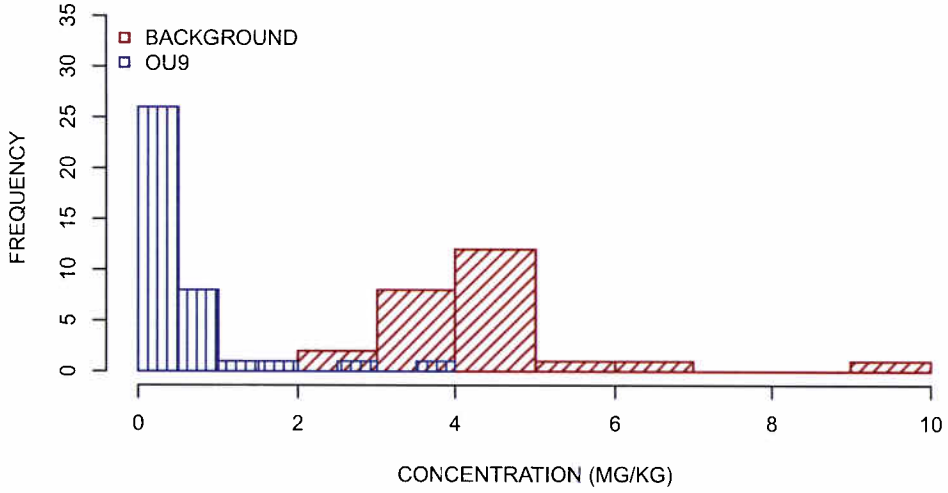
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	2.6	0.14
25TH PERCENTILE	3.7	0.19
MEDIAN	4.2	0.29
MEAN	4.3	0.57
75TH PERCENTILE	4.5	0.59
MAXIMUM	9.4	3.7

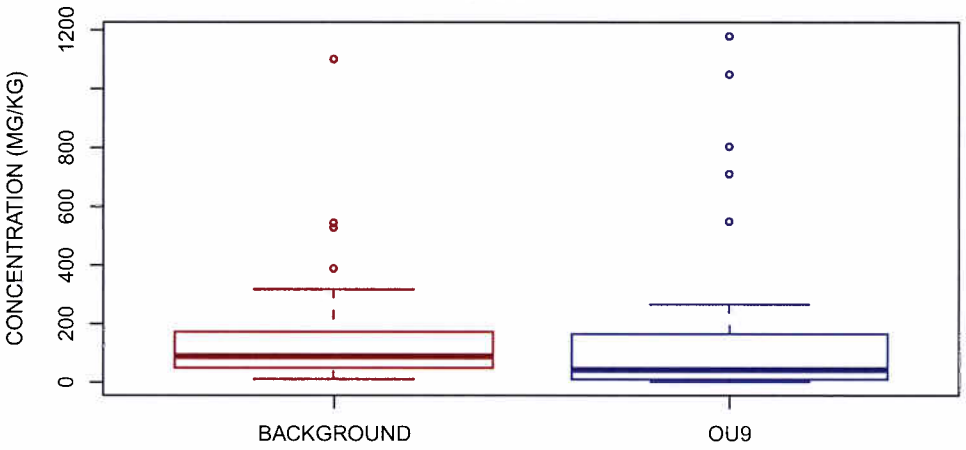
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

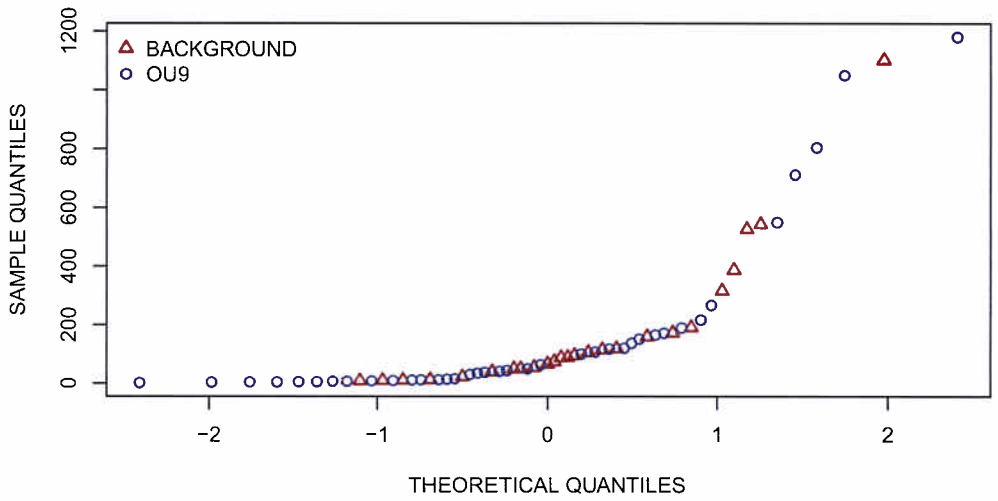
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 2 OF 20

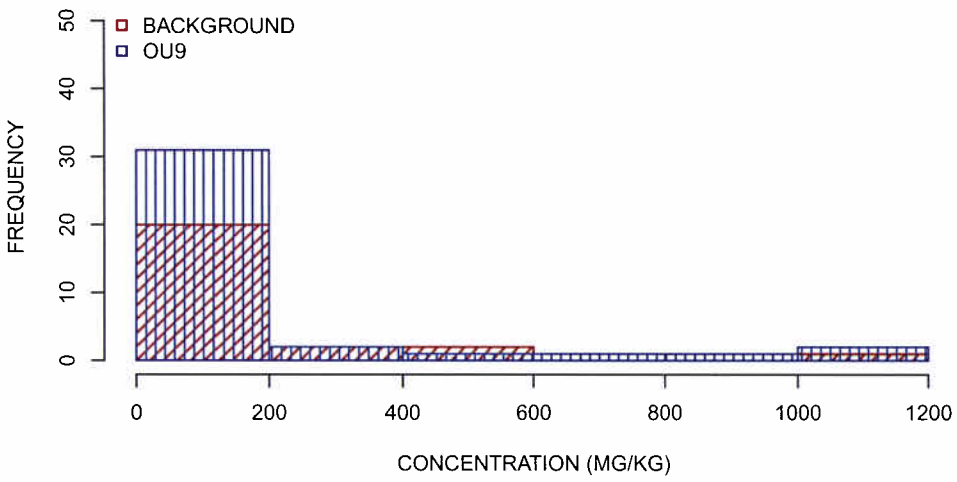
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



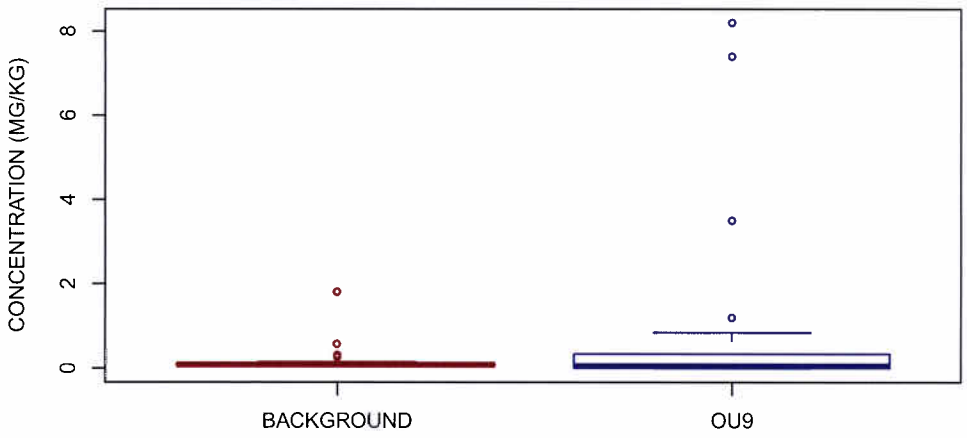
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	9.5	2.4
25TH PERCENTILE	51	11
MEDIAN	90	44
MEAN	180	170
75TH PERCENTILE	170	160
MAXIMUM	1100	1200

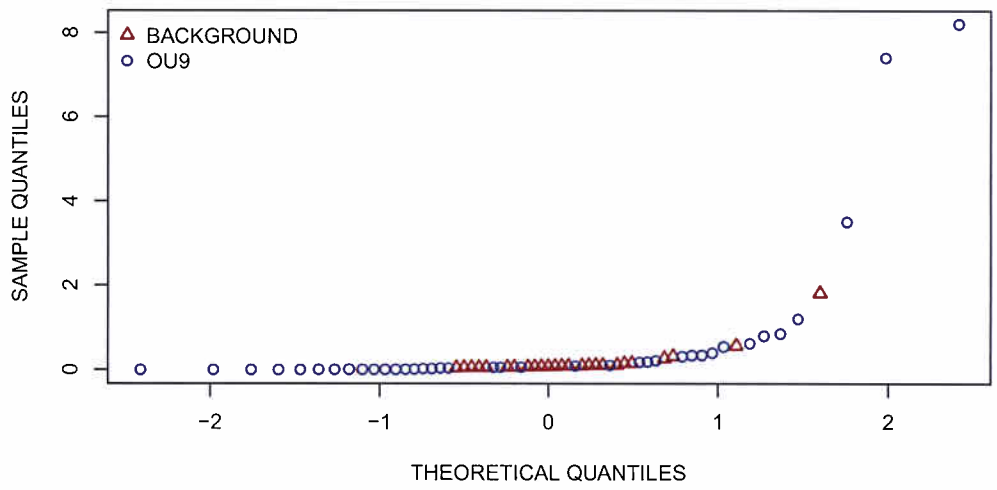
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 3 OF 20

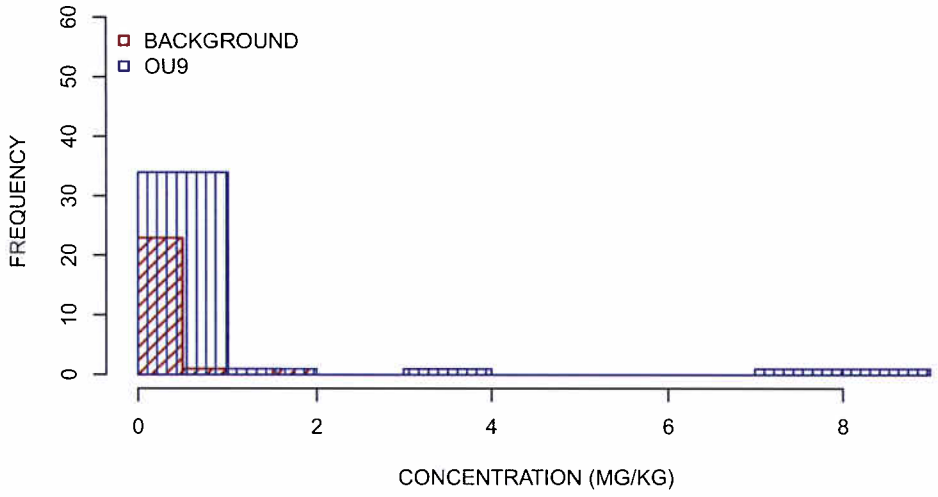
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	0.05	0.0024
25TH PERCENTILE	0.065	0.012
MEDIAN	0.09	0.062
MEAN	0.19	0.68
75TH PERCENTILE	0.12	0.35
MAXIMUM	1.8	8.2

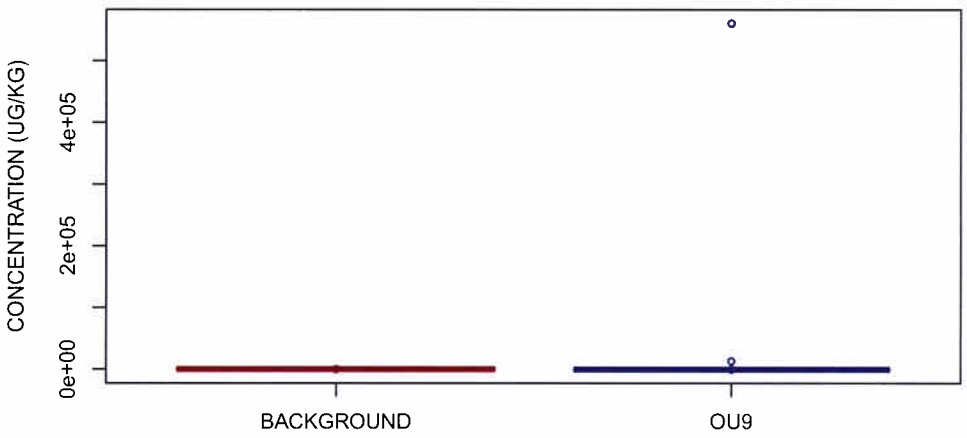
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

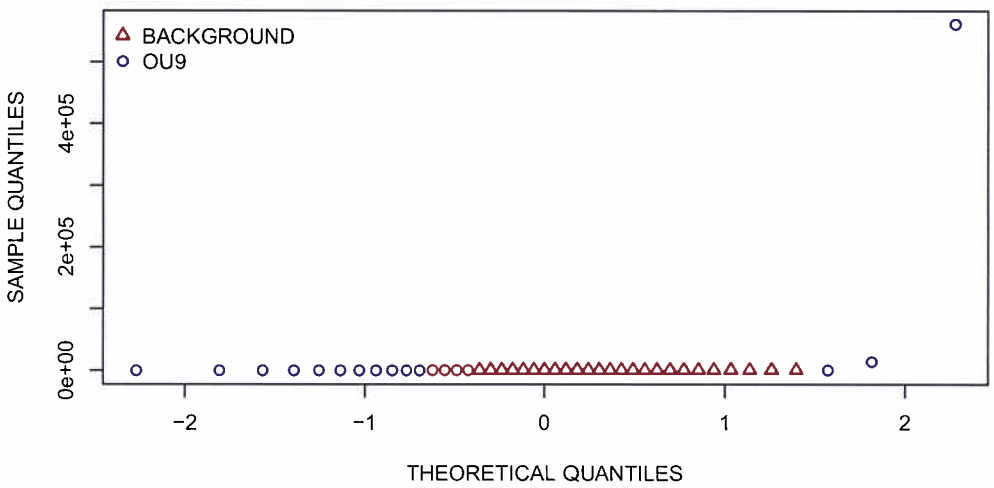
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

2-METHYLNAPHTHALENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 4 OF 20

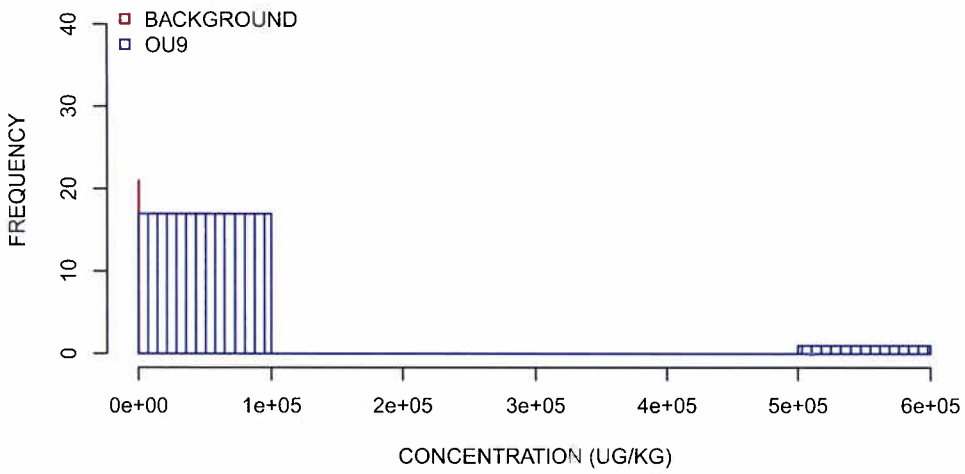
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



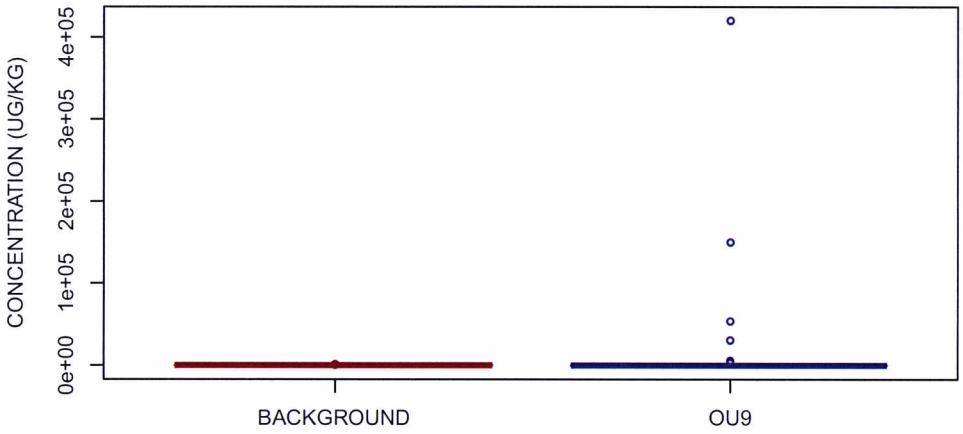
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	44	1.8
25TH PERCENTILE	180	1.8
MEDIAN	180	1.9
MEAN	180	32000
75TH PERCENTILE	200	2
MAXIMUM	220	560000

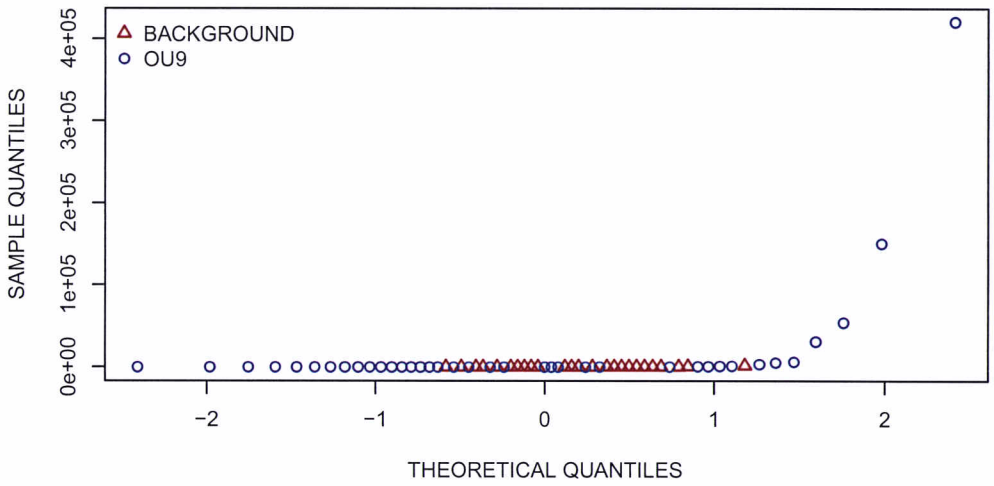
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHRYSENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 5 OF 20

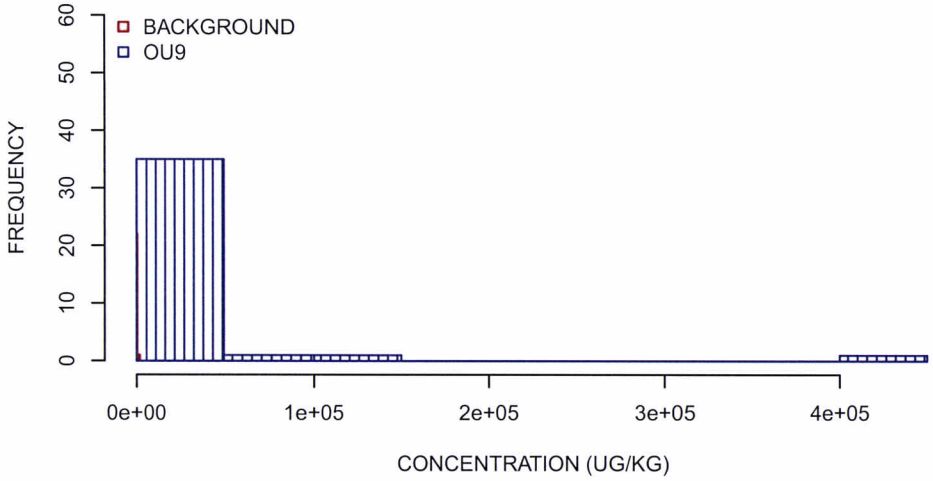
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	37	1.8
25TH PERCENTILE	61	4
MEDIAN	130	46
MEAN	200	18000
75TH PERCENTILE	190	680
MAXIMUM	1600	420000

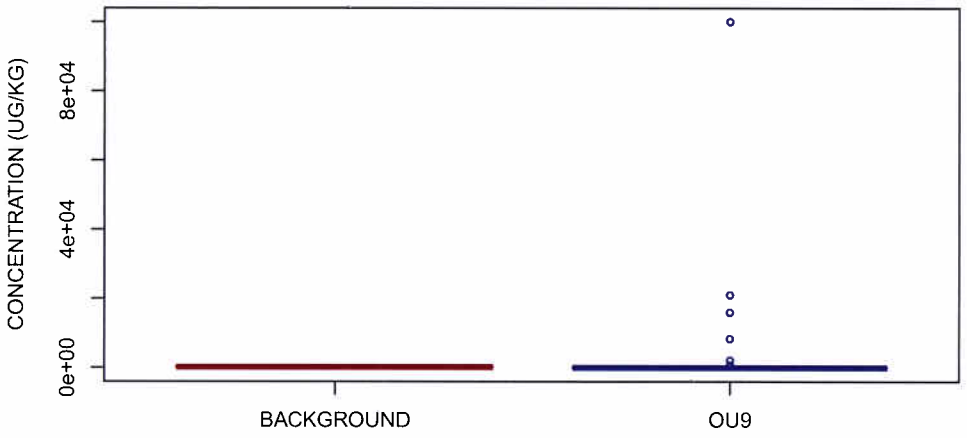
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

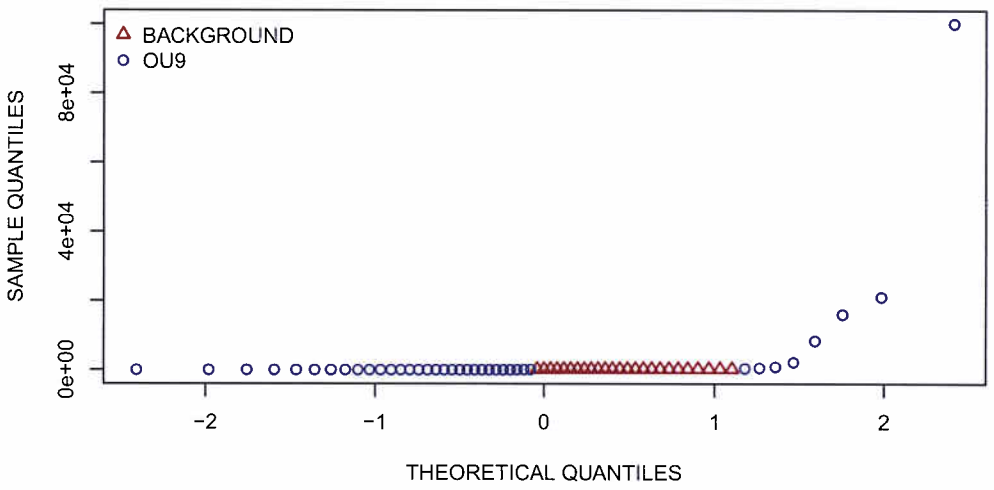
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ACENAPHTHENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 6 OF 20

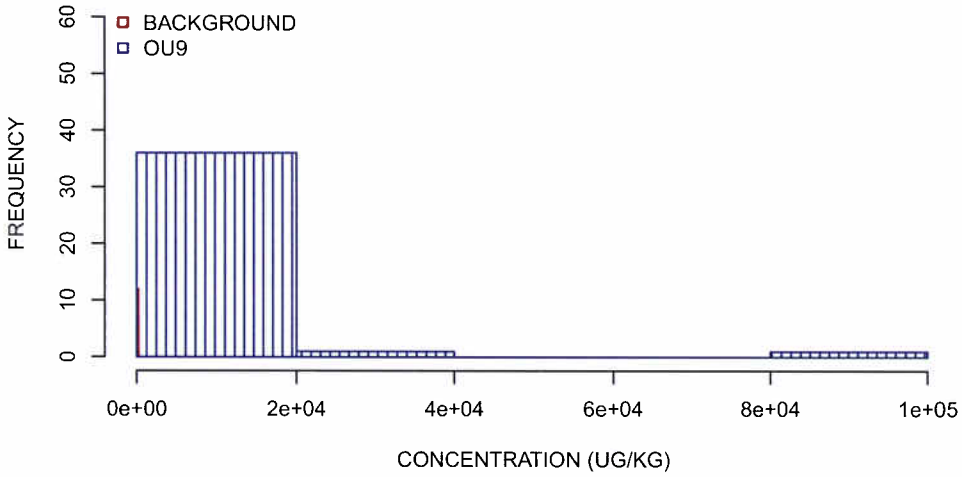
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	180	1.8
25TH PERCENTILE	180	1.8
MEDIAN	180	2
MEAN	190	3900
75TH PERCENTILE	200	67
MAXIMUM	220	1e+05

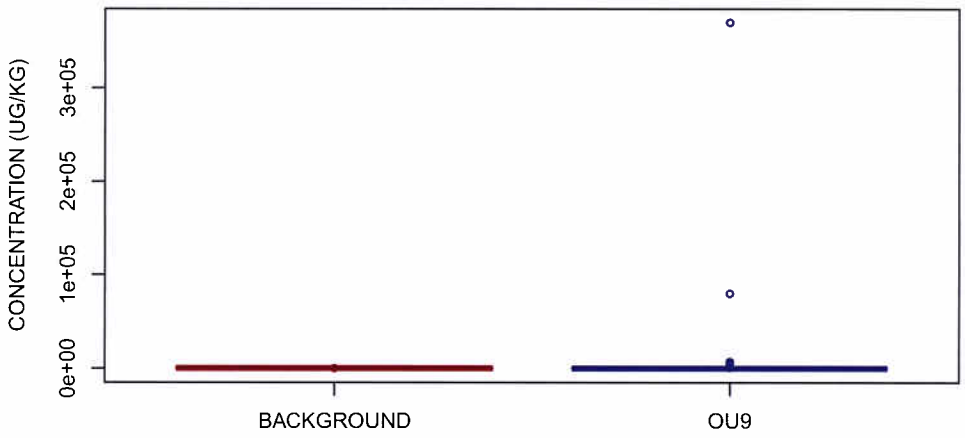
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

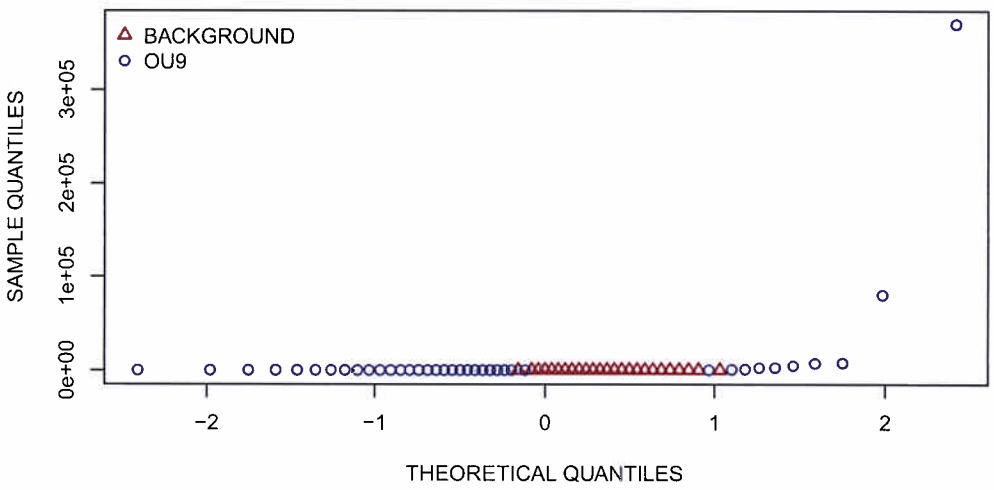
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ACENAPHTHYLENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 7 OF 20

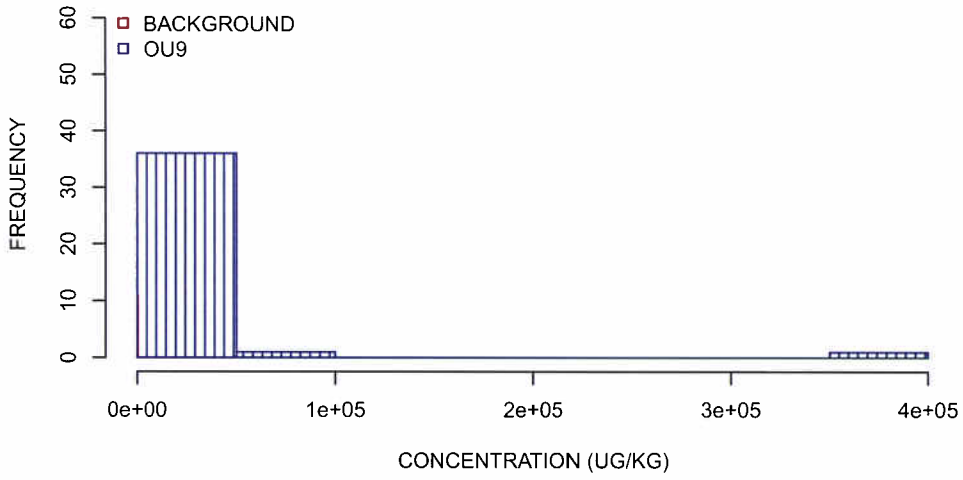
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	74	1.8
25TH PERCENTILE	180	1.8
MEDIAN	180	12
MEAN	180	13000
75TH PERCENTILE	200	180
MAXIMUM	220	370000

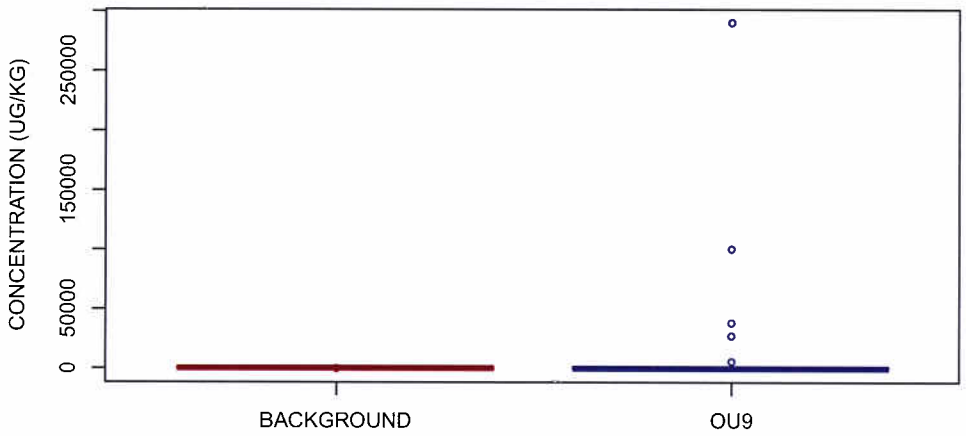
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

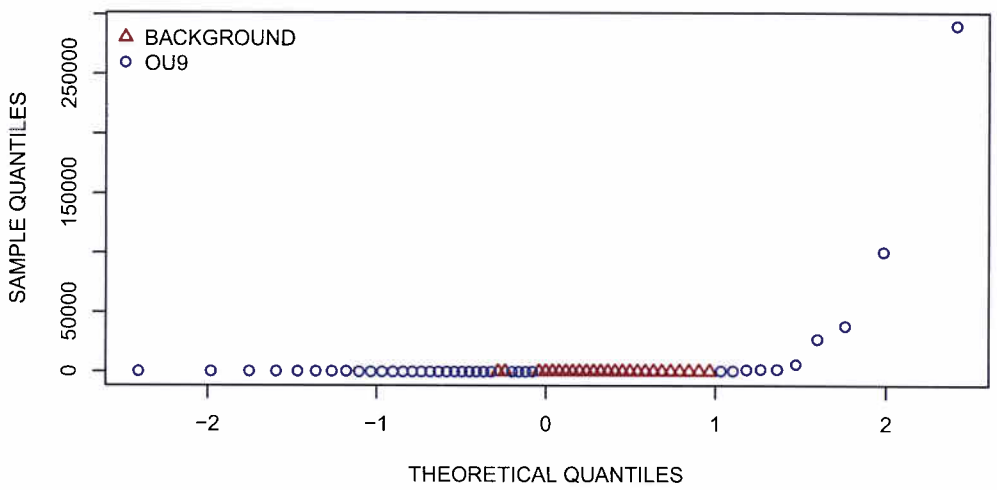
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ANTHRACENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 8 OF 20

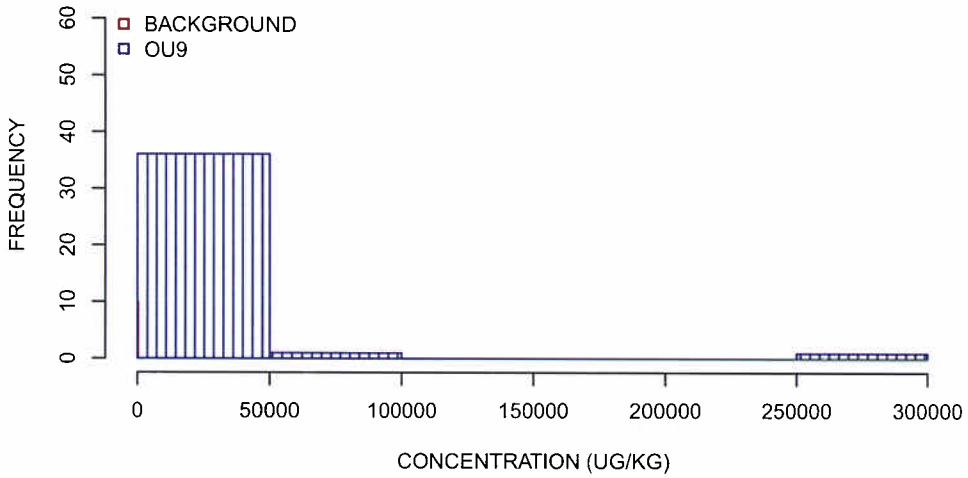
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	58	1.8
25TH PERCENTILE	180	1.8
MEDIAN	180	12
MEAN	180	12000
75TH PERCENTILE	200	520
MAXIMUM	220	290000

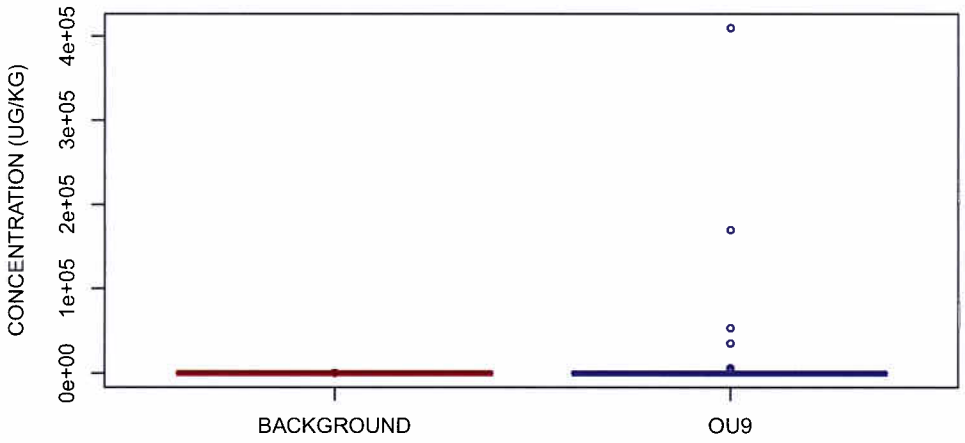
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

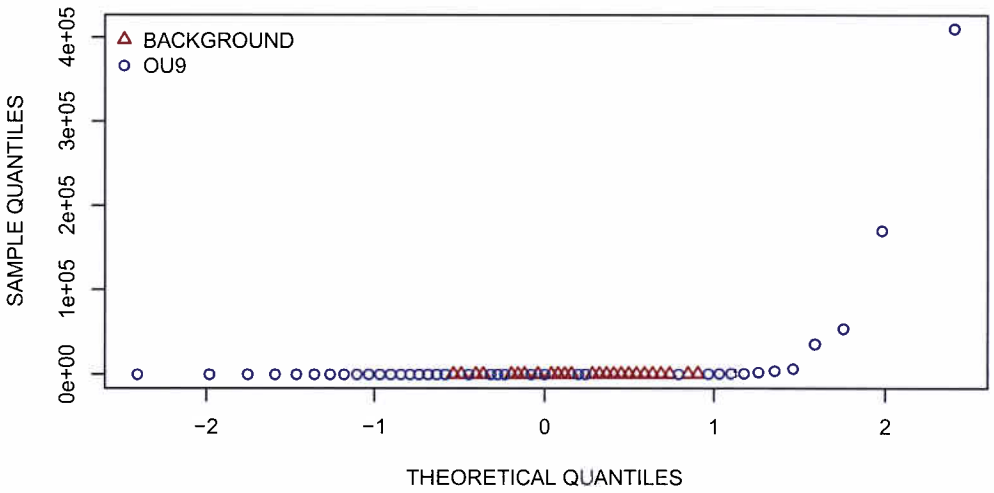
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(A)ANTHRACENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 9 OF 20

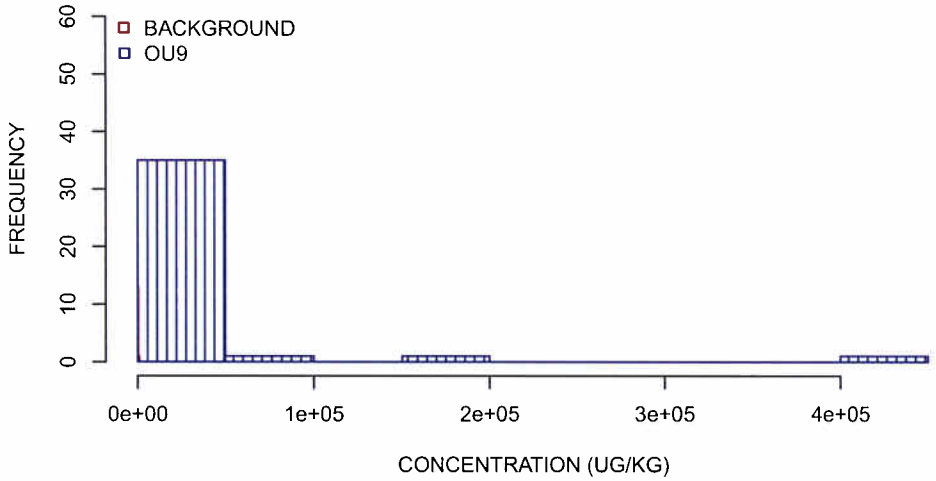
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	37	1.8
25TH PERCENTILE	69	3.3
MEDIAN	180	46
MEAN	160	18000
75TH PERCENTILE	190	770
MAXIMUM	640	410000

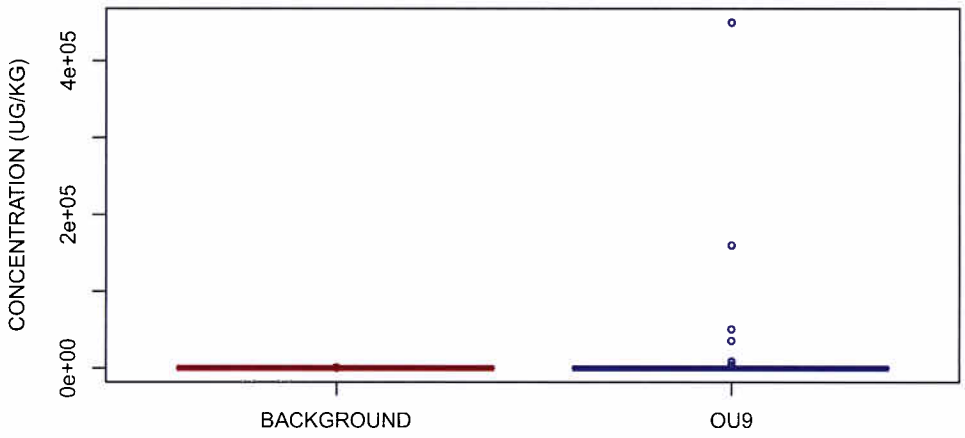
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

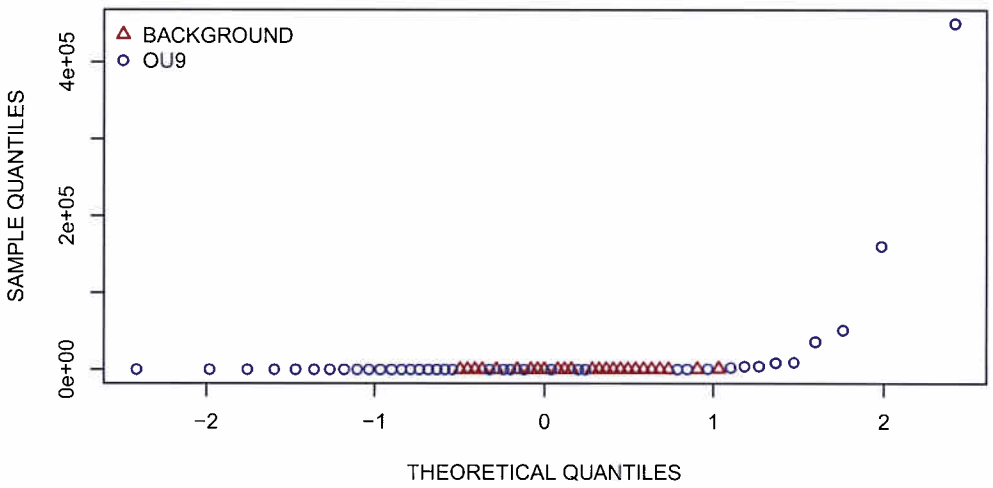
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(A)PYRENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 10 OF 20

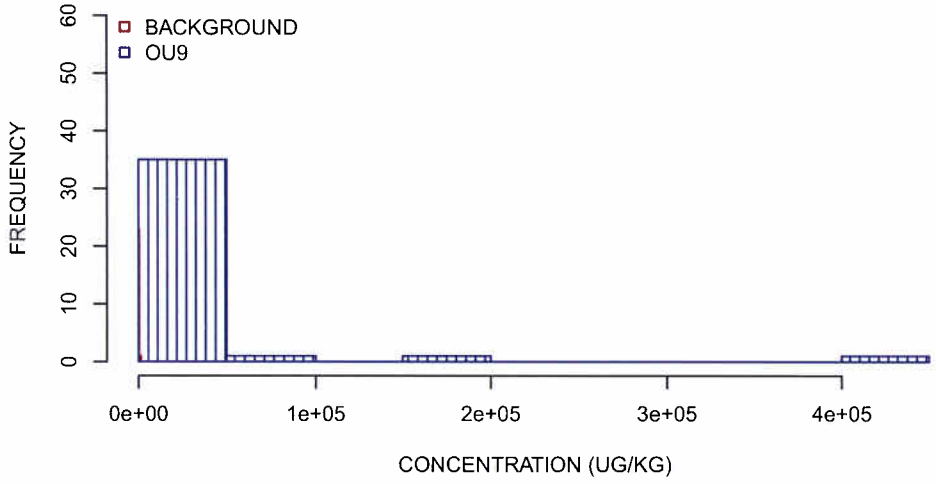
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	36	1.8
25TH PERCENTILE	85	2.7
MEDIAN	180	40
MEAN	180	19000
75TH PERCENTILE	190	750
MAXIMUM	1100	450000

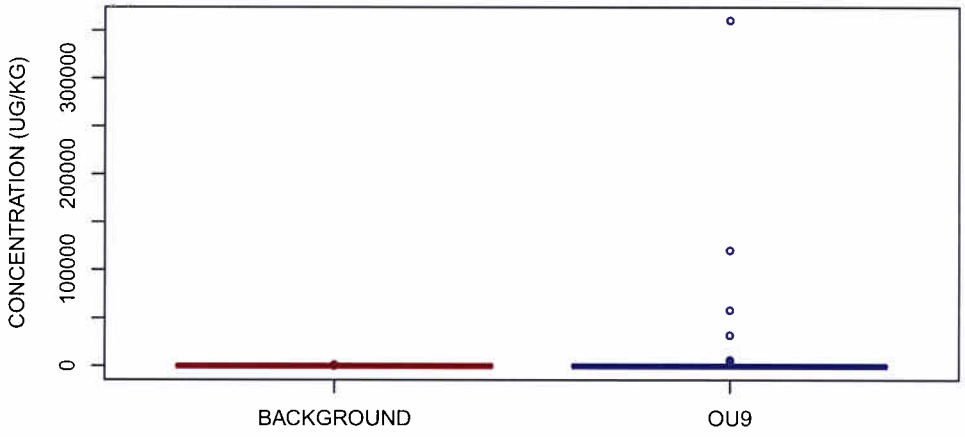
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

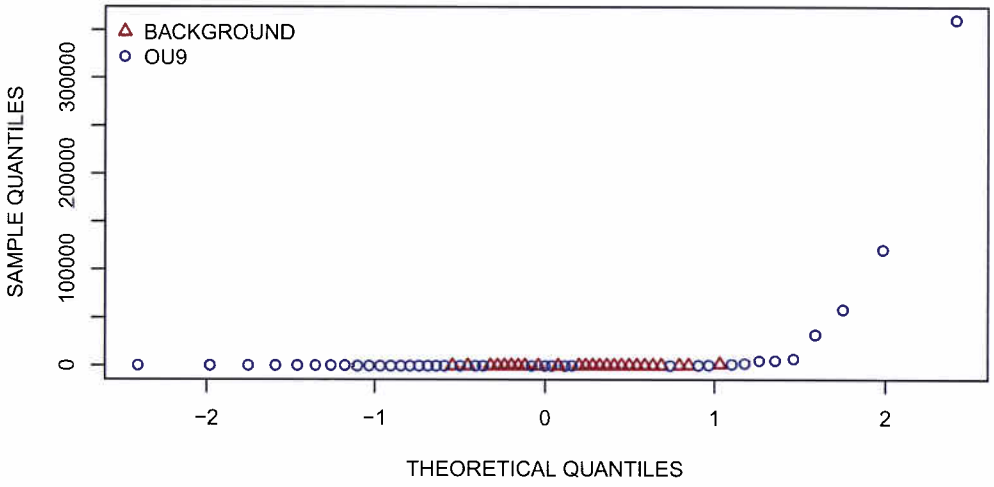
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(B)FLUORANTHENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 11 OF 20

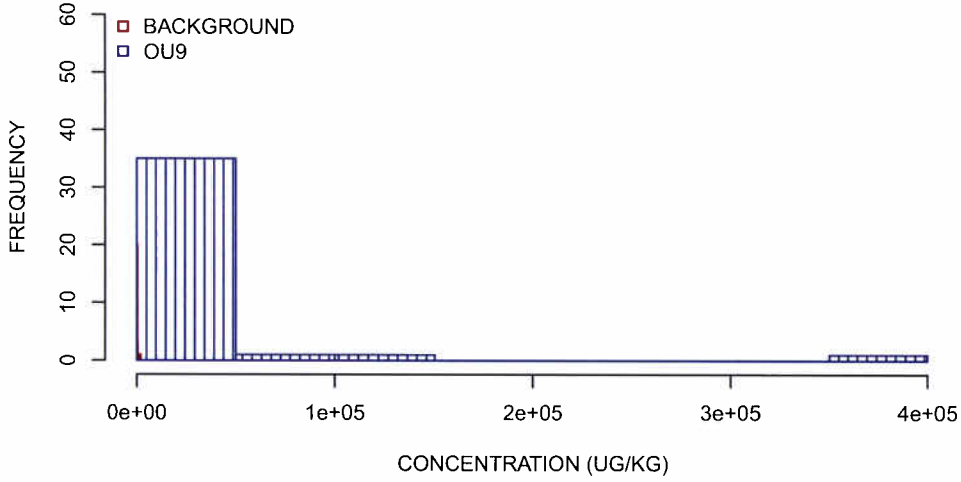
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	41	1.8
25TH PERCENTILE	62	4
MEDIAN	180	45
MEAN	220	16000
75TH PERCENTILE	200	640
MAXIMUM	1700	360000

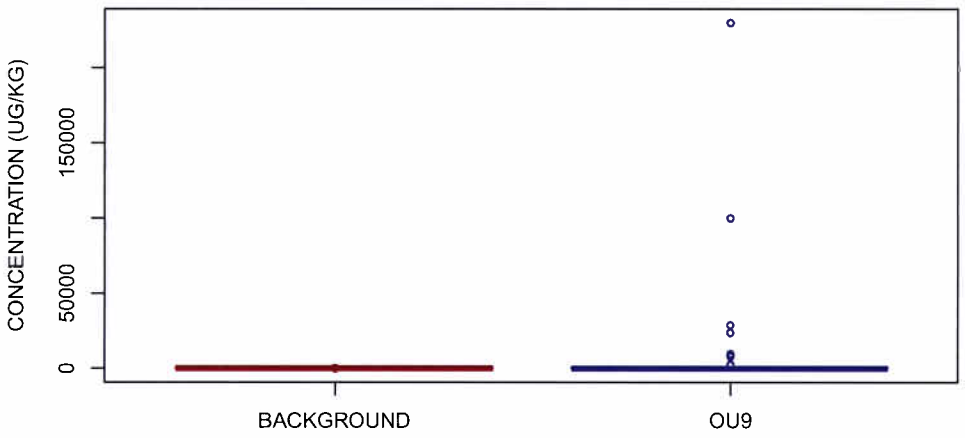
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

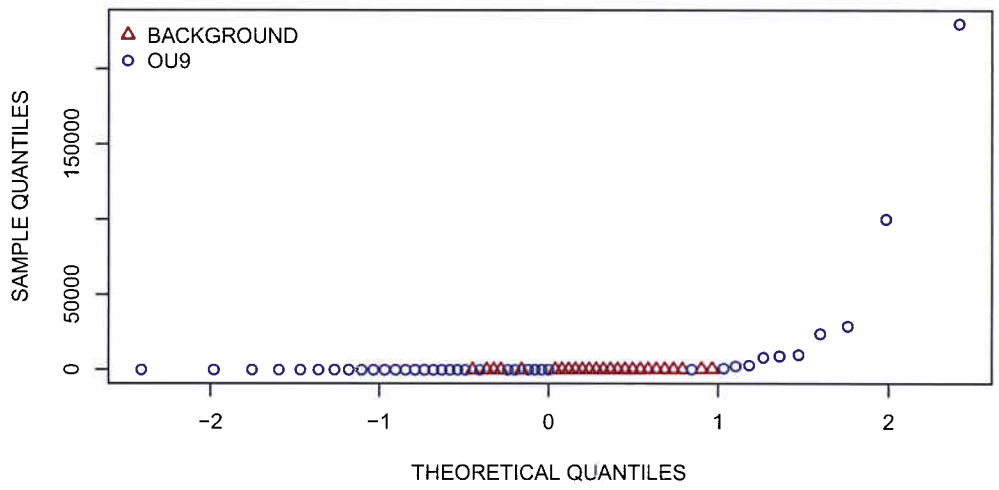
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(G,H,I)PERYLENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 12 OF 20

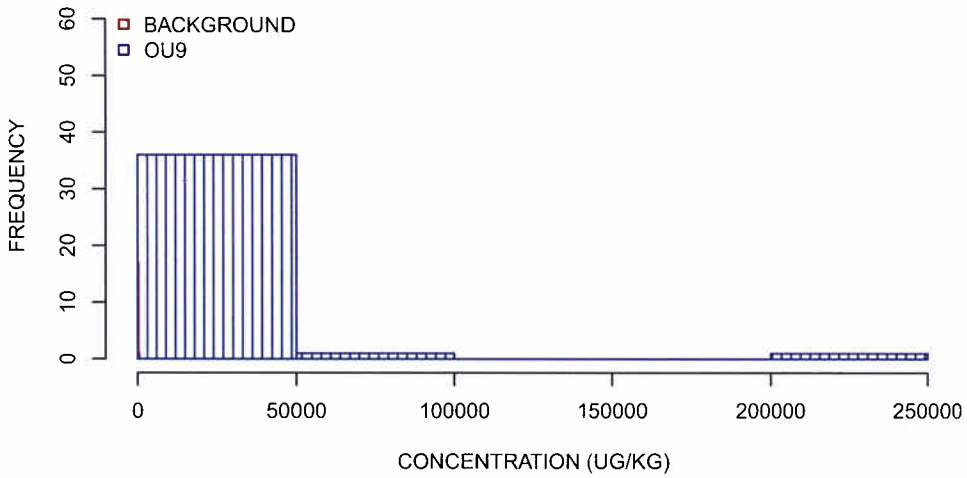
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	39	1.8
25TH PERCENTILE	180	3.6
MEDIAN	180	27
MEAN	180	11000
75TH PERCENTILE	200	800
MAXIMUM	410	230000

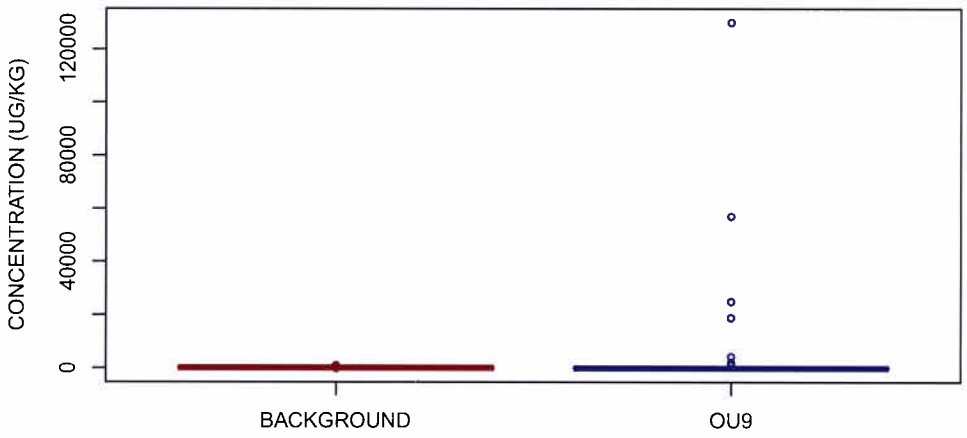
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

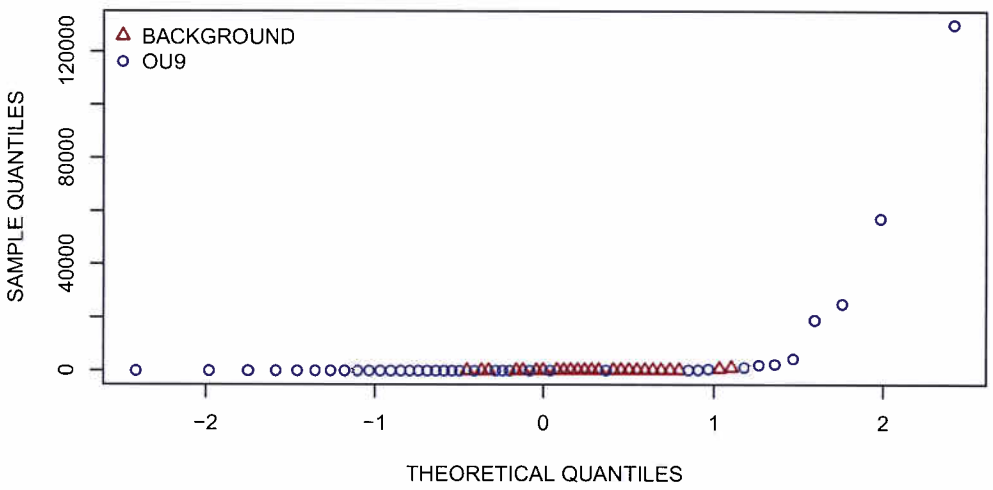
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(K)FLUORANTHENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 13 OF 20

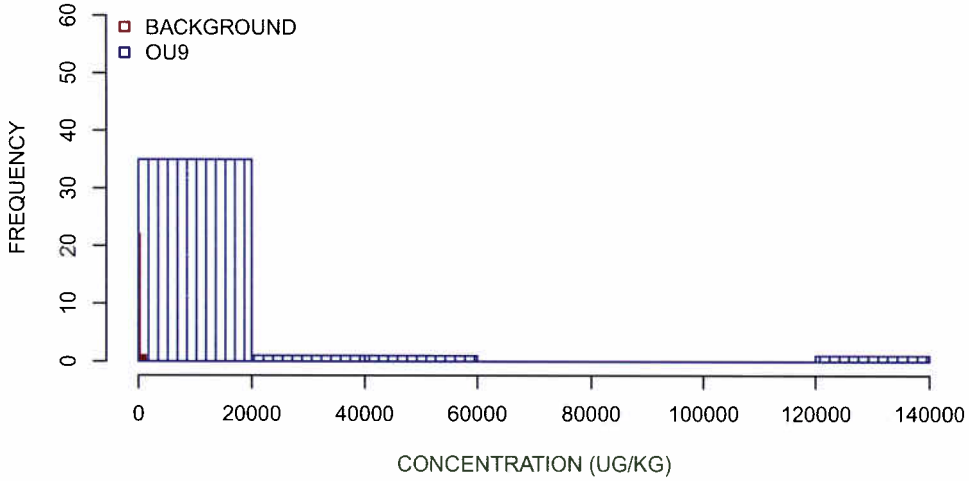
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



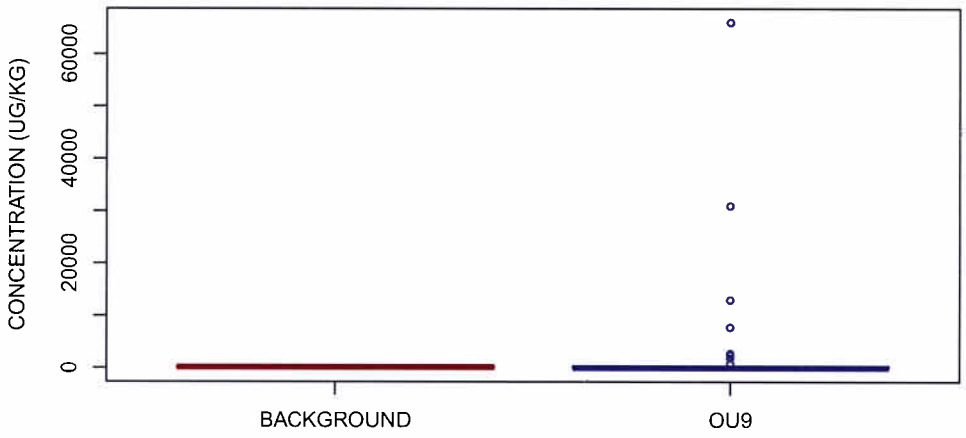
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	38	1.8
25TH PERCENTILE	150	2
MEDIAN	180	28
MEAN	210	6400
75TH PERCENTILE	200	290
MAXIMUM	1100	130000

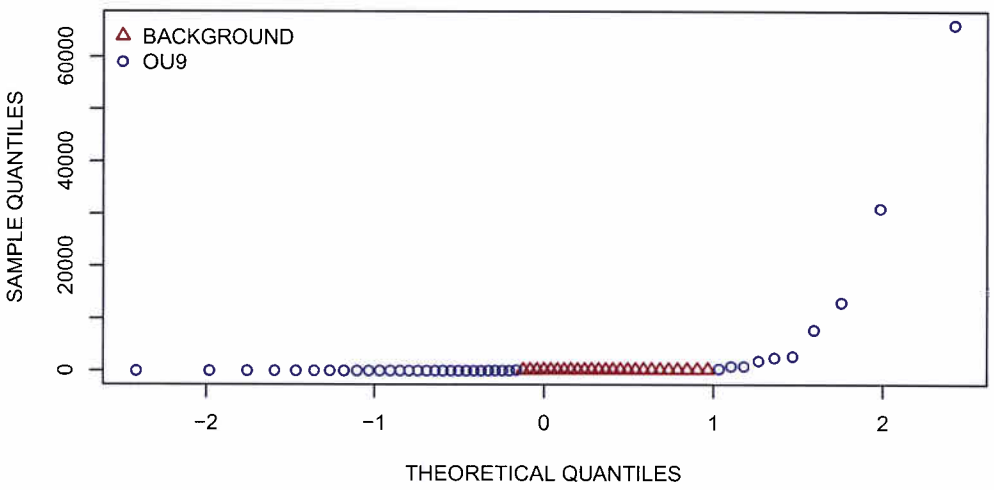
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

DIBENZO(A,H)ANTHRACENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 14 OF 20

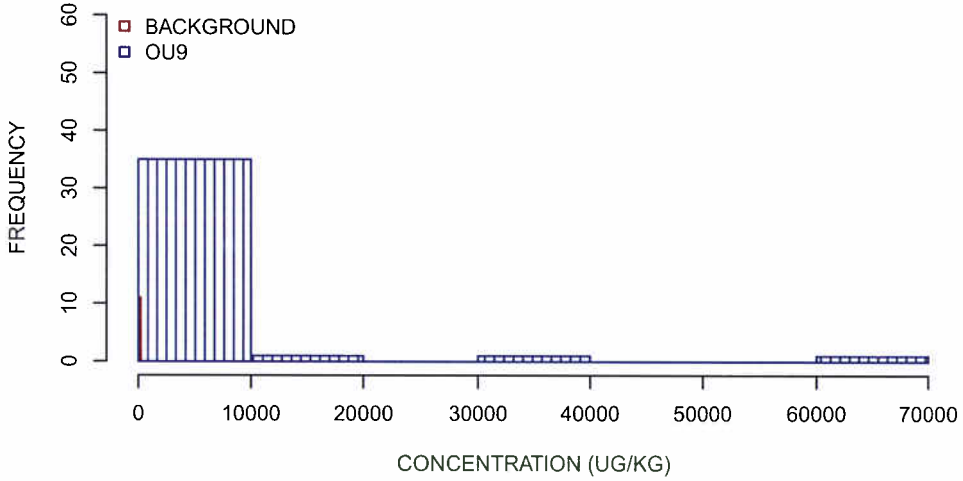
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	180	1.8
25TH PERCENTILE	180	1.8
MEDIAN	190	9
MEAN	190	3400
75TH PERCENTILE	200	280
MAXIMUM	220	66000

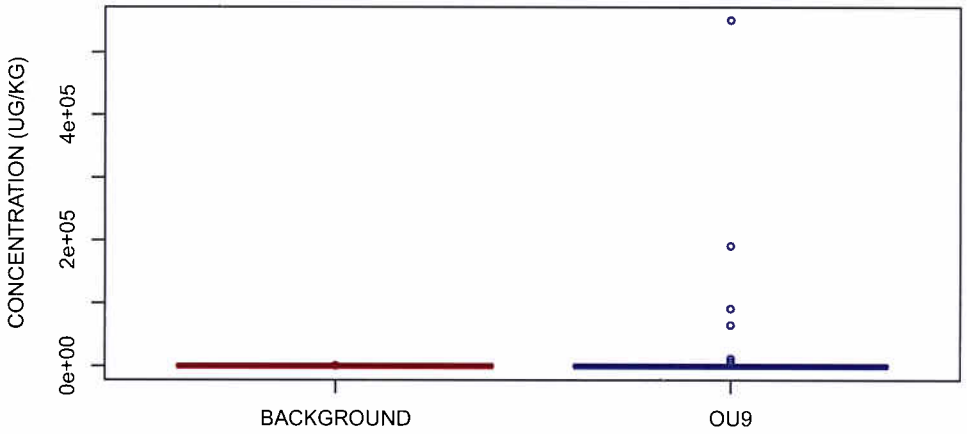
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

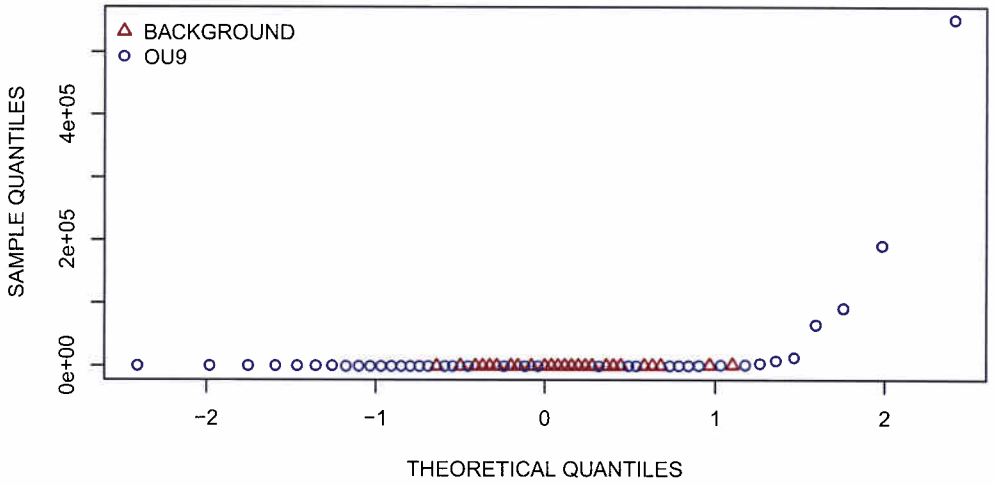
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

FLUORANTHENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 15 OF 20

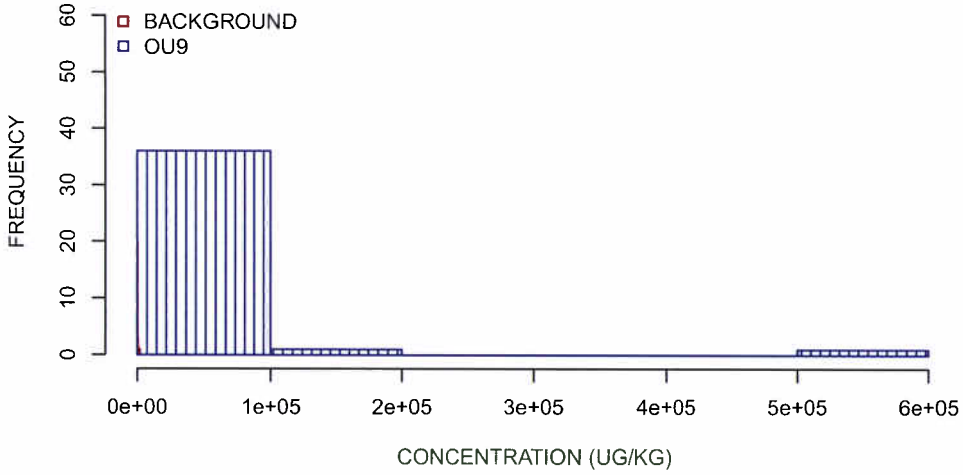
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	43	1.8
25TH PERCENTILE	86	6.5
MEDIAN	160	68
MEAN	250	24000
75TH PERCENTILE	200	860
MAXIMUM	1700	550000

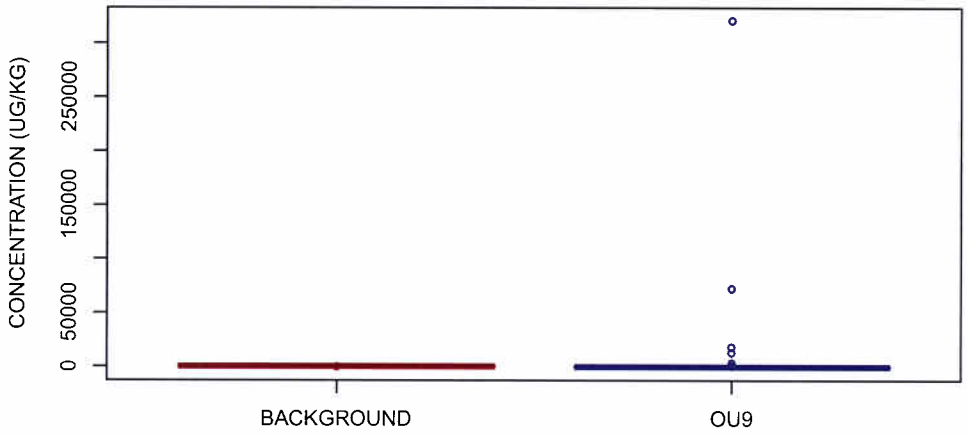
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

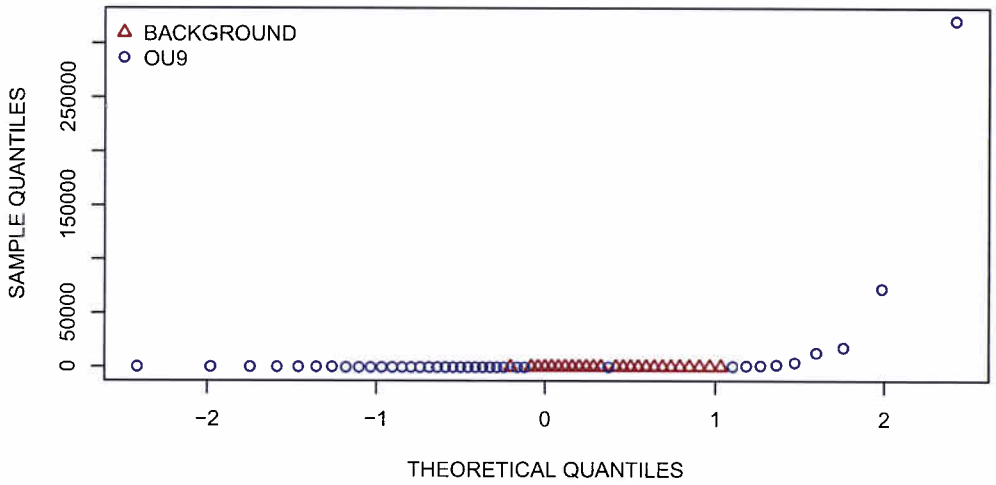
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

FLUORENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 16 OF 20

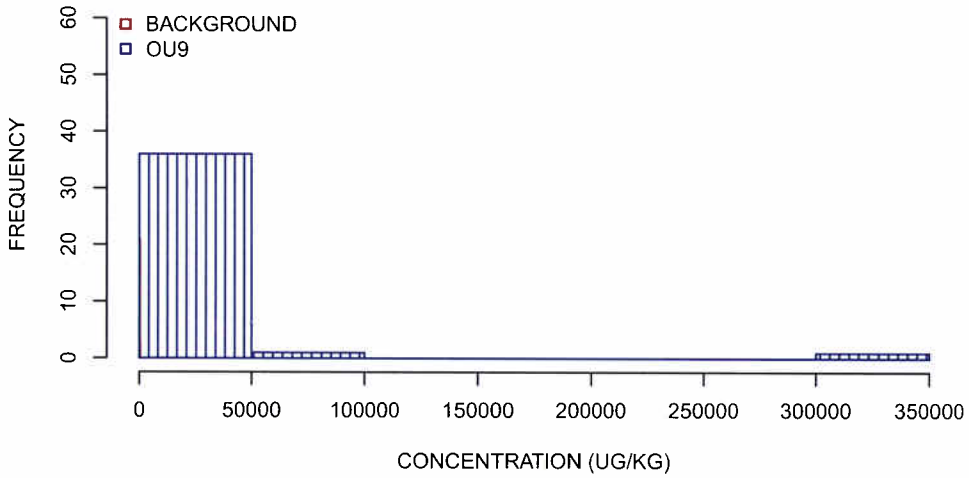
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



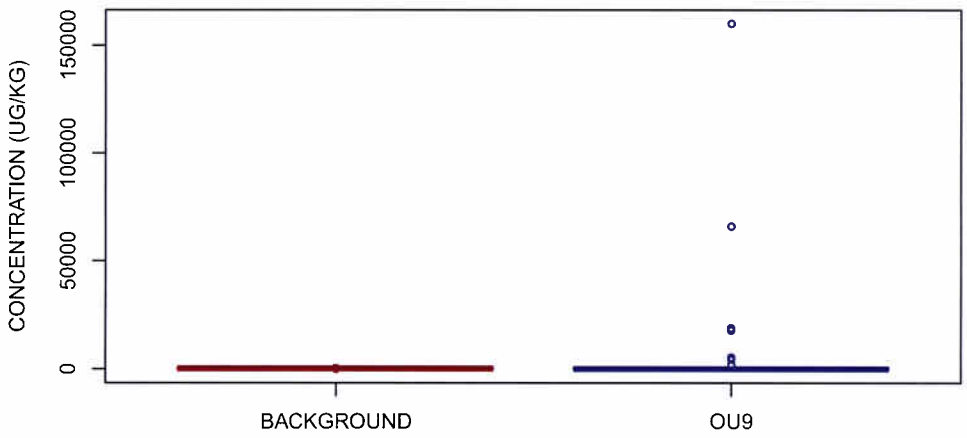
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	180	1.8
MEDIAN	180	5.2
MEAN	180	11000
75TH PERCENTILE	200	150
MAXIMUM	220	320000

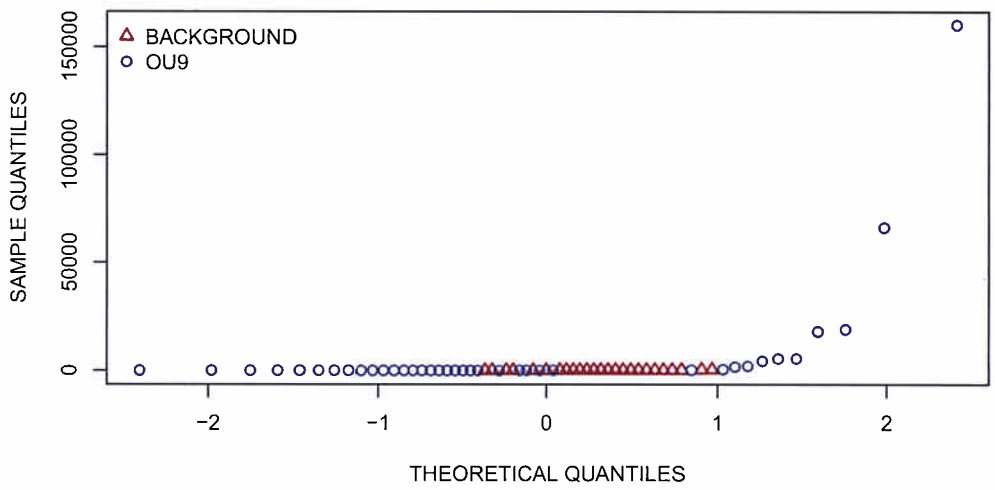
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

INDENO(1,2,3-CD)PYRENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 17 OF 20

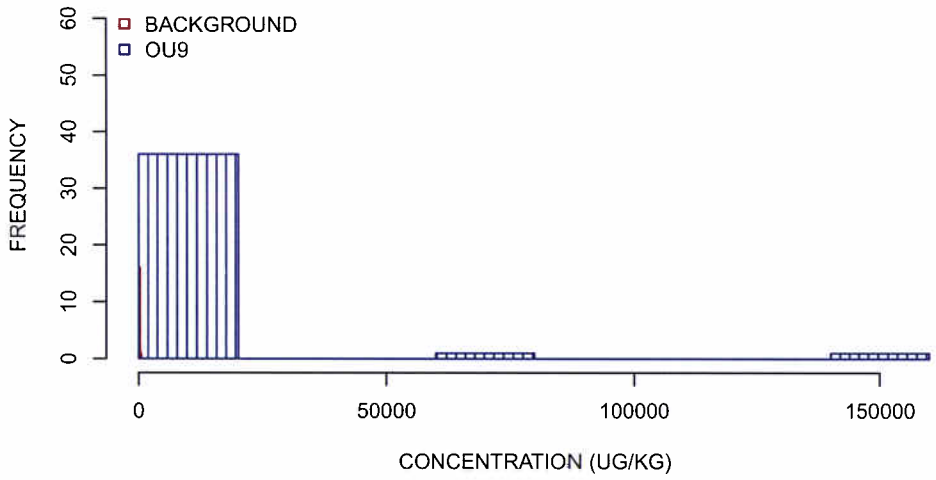
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



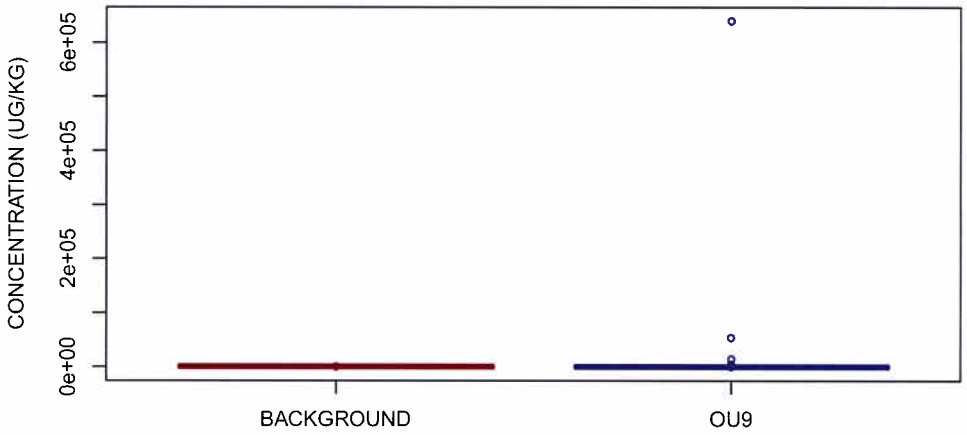
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	38	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	22
MEAN	180	7500
75TH PERCENTILE	200	460
MAXIMUM	440	160000

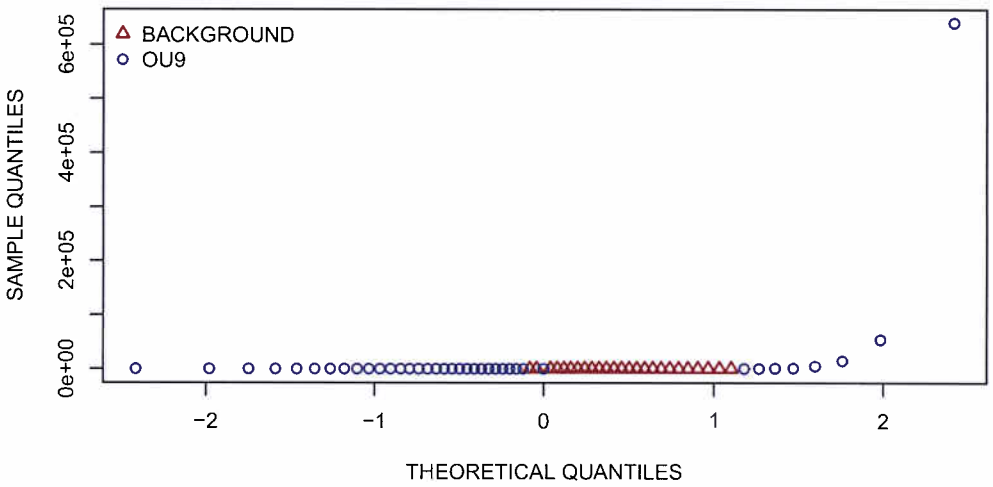
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

NAPHTHALENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 18 OF 20

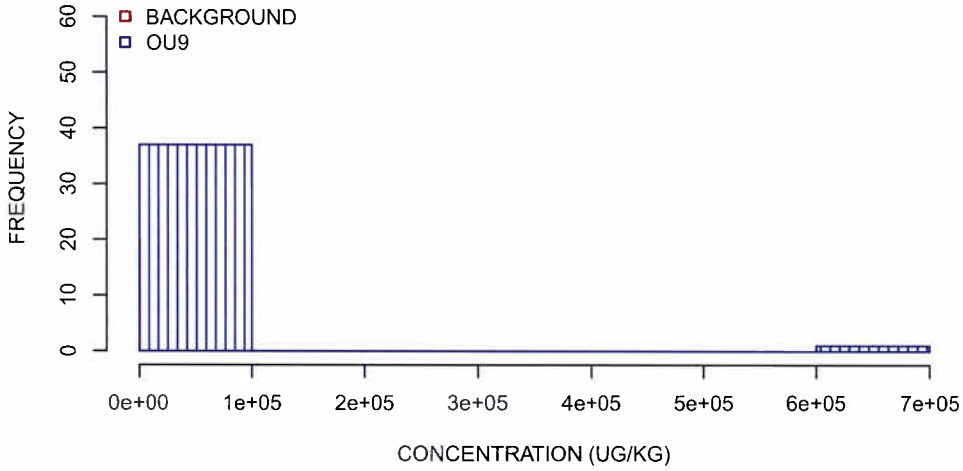
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



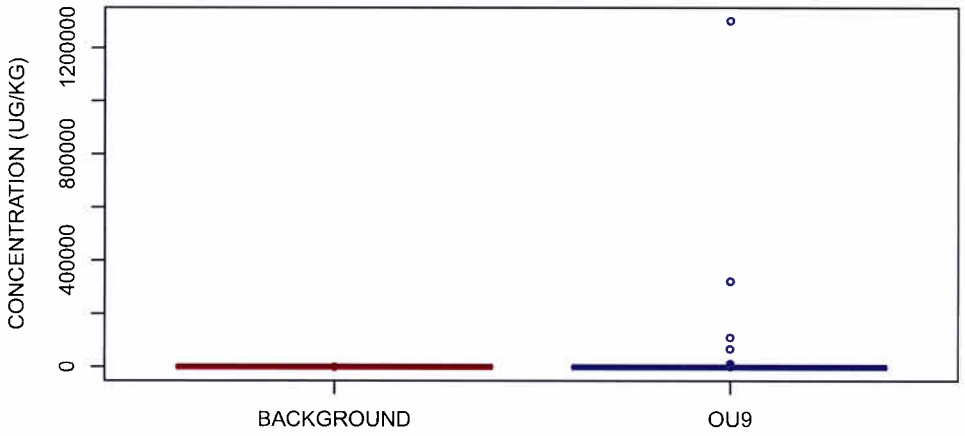
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	4.7
MEAN	180	19000
75TH PERCENTILE	200	34
MAXIMUM	220	640000

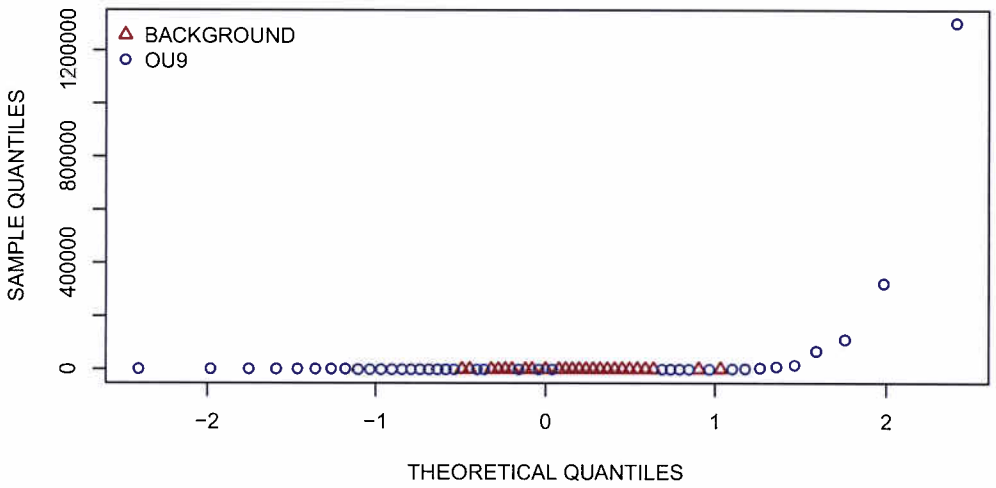
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

PHENANTHRENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 19 OF 20

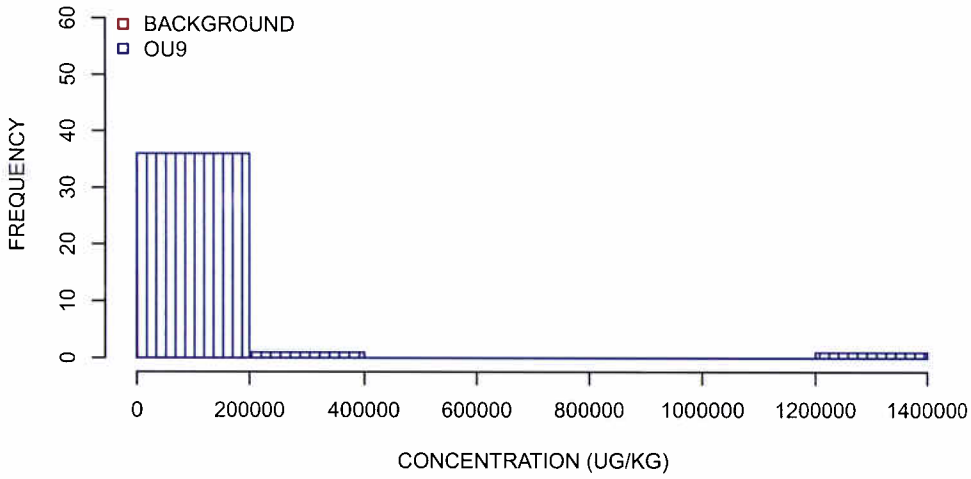
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	40	1.8
25TH PERCENTILE	91	5.2
MEDIAN	180	43
MEAN	160	48000
75TH PERCENTILE	190	320
MAXIMUM	470	1300000

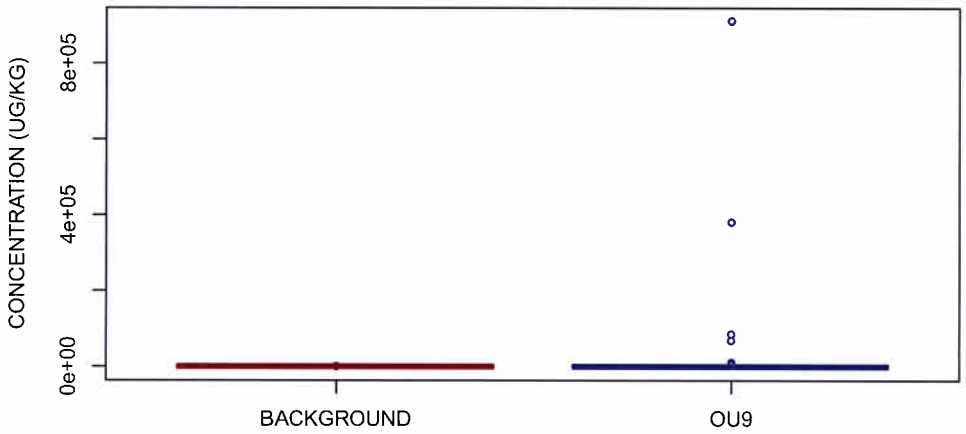
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

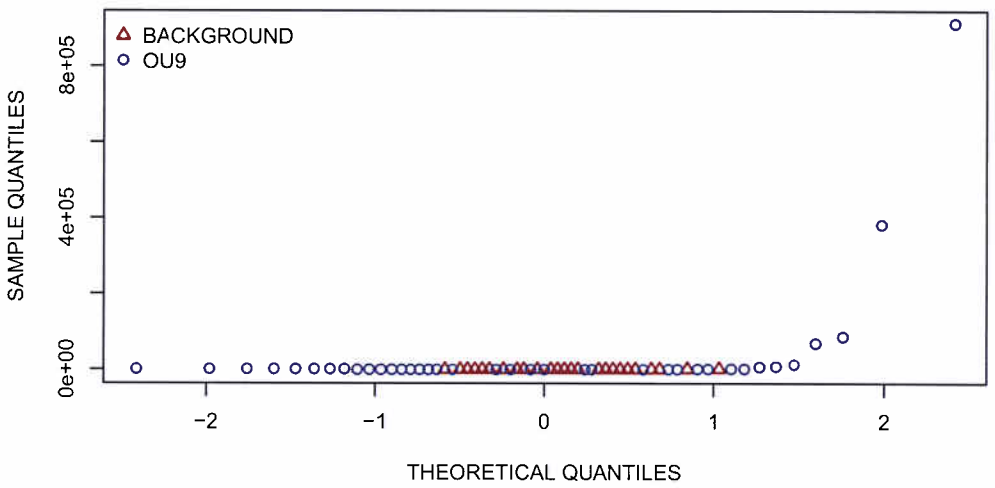
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

PYRENE SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 20 OF 20

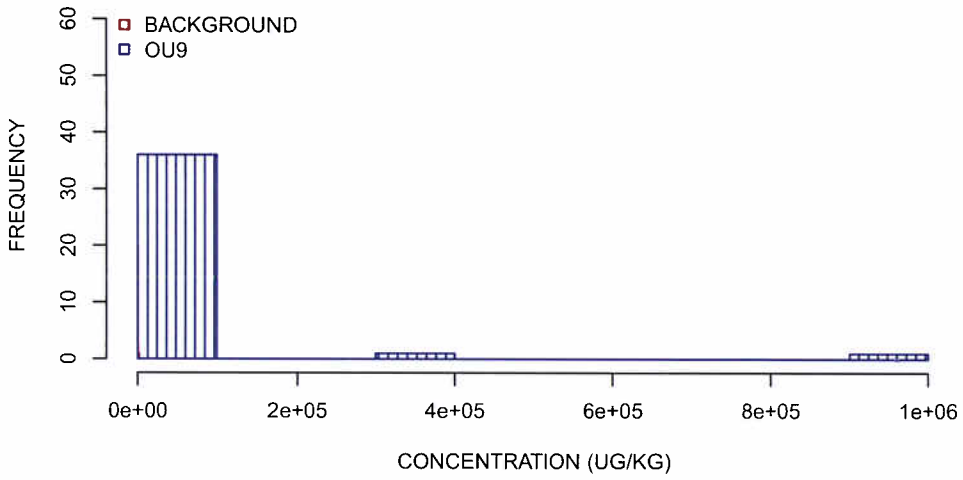
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	83	6
MEDIAN	140	80
MEAN	220	39000
75TH PERCENTILE	200	1200
MAXIMUM	1400	910000

UNITS ARE UG/KG

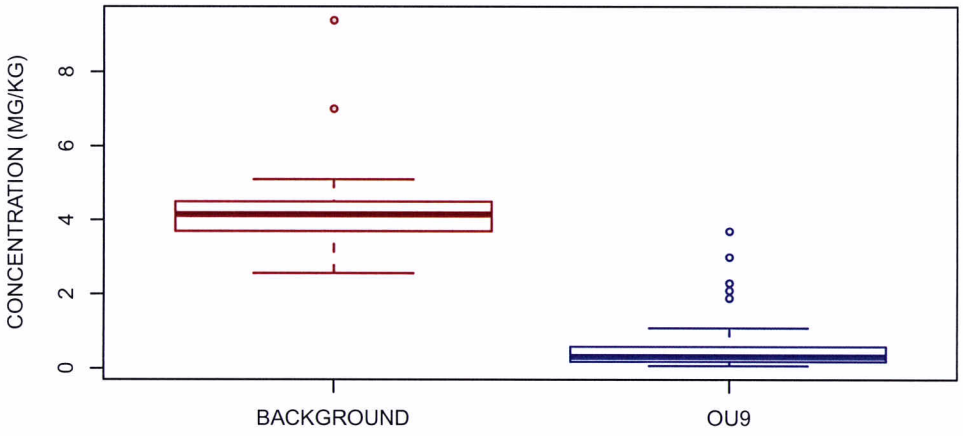
1/2 DETECTION LIMIT USED FOR NON-DETECTS

SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

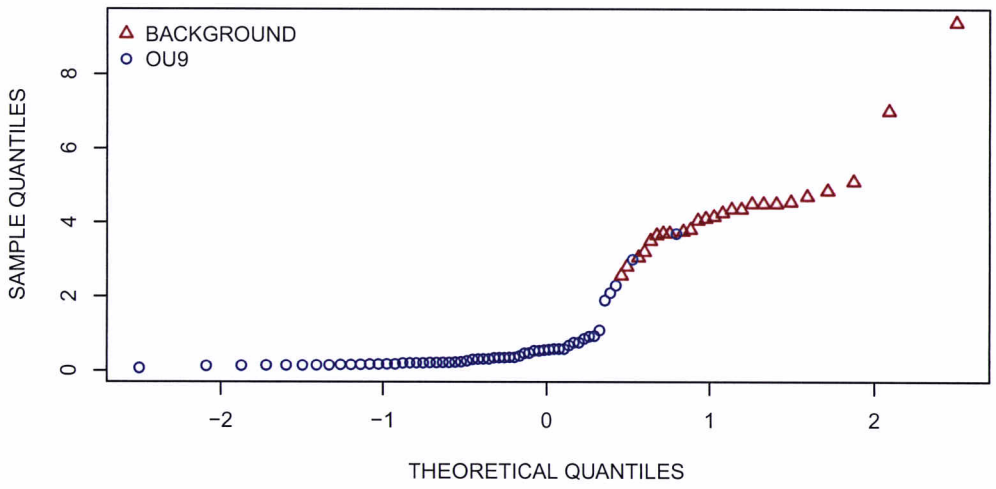
COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS

ANTIMONY COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 1 OF 20

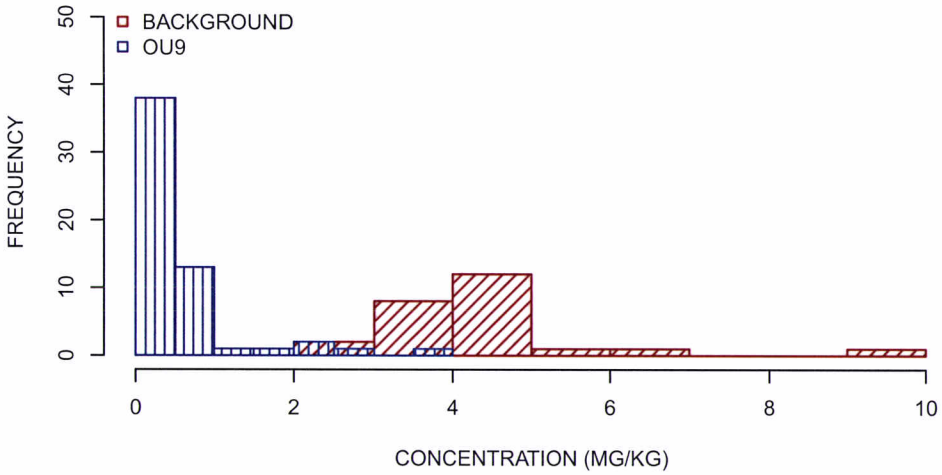
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



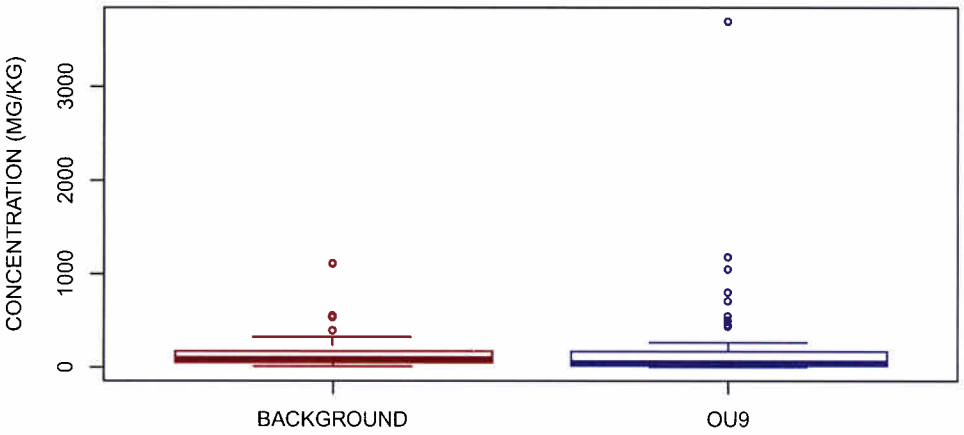
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	2.6	0.075
25TH PERCENTILE	3.7	0.19
MEDIAN	4.2	0.33
MEAN	4.3	0.57
75TH PERCENTILE	4.5	0.6
MAXIMUM	9.4	3.7

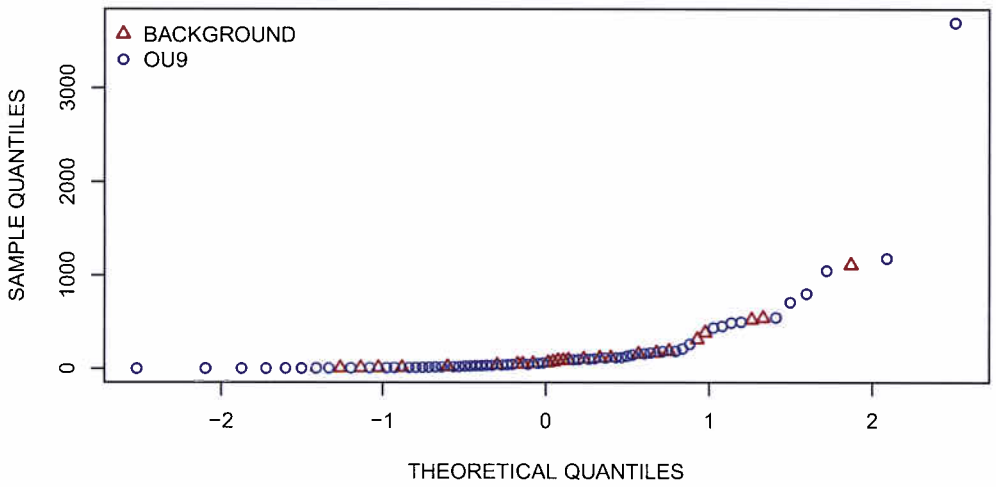
UNITS ARE MG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

LEAD COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 2 OF 20

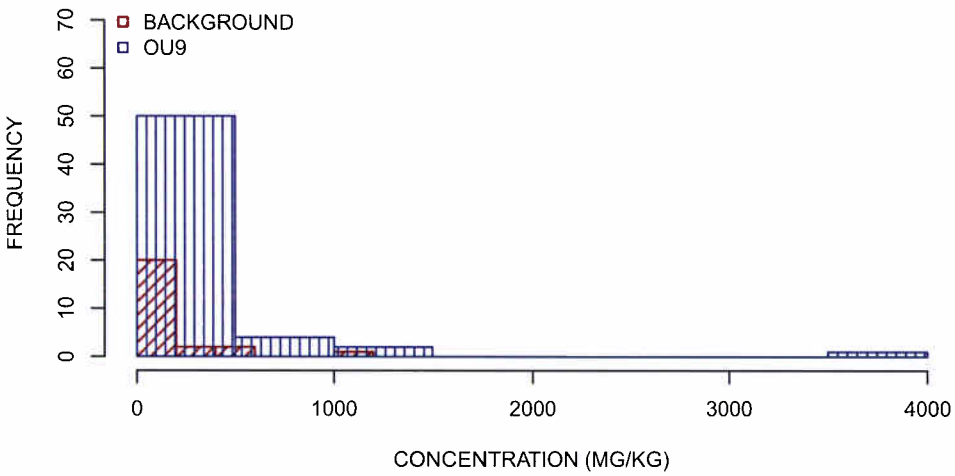
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	9.5	2.4
25TH PERCENTILE	51	17
MEDIAN	90	48
MEAN	180	230
75TH PERCENTILE	170	170
MAXIMUM	1100	3700

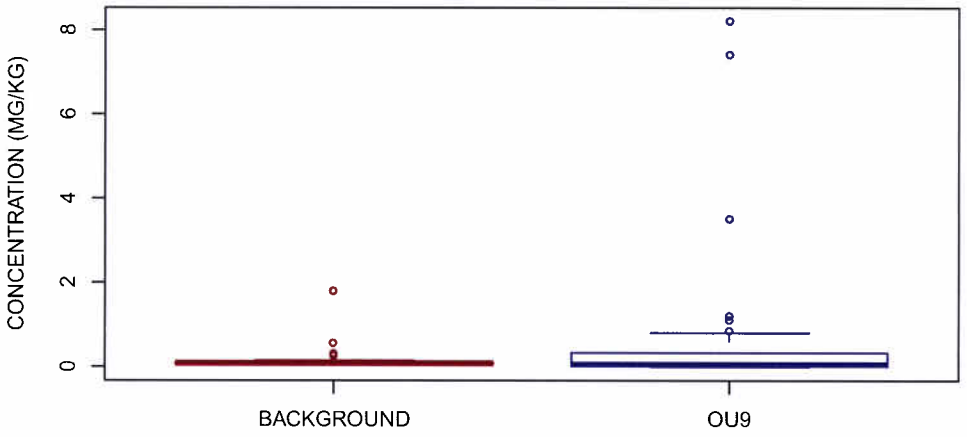
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

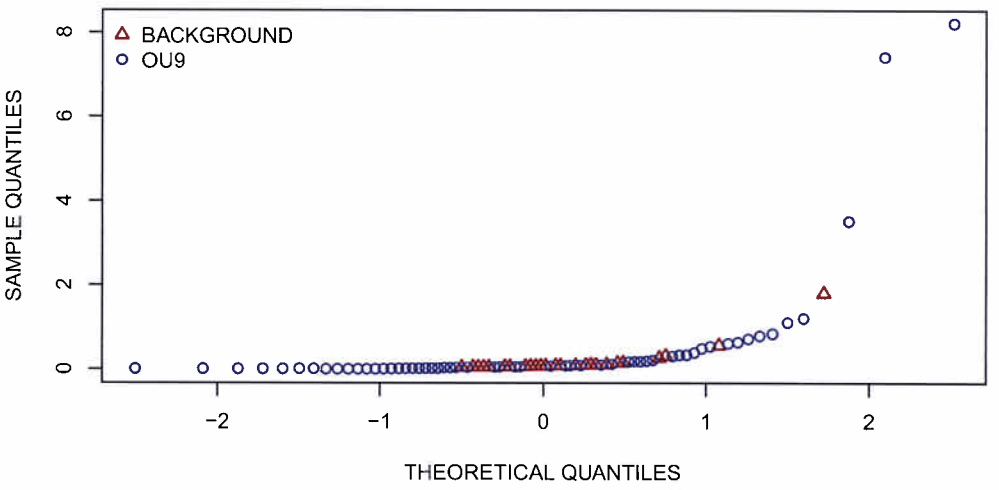
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

MERCURY COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 3 OF 20

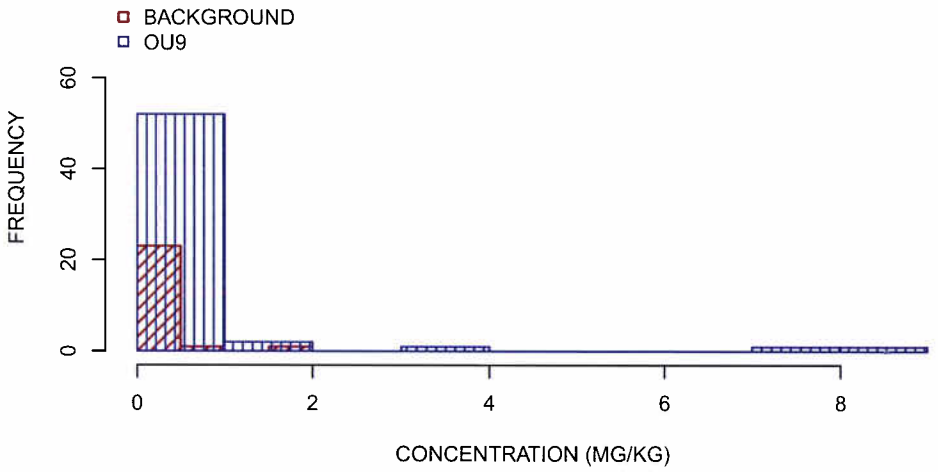
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	0.05	0.0024
25TH PERCENTILE	0.065	0.017
MEDIAN	0.09	0.067
MEAN	0.19	0.52
75TH PERCENTILE	0.12	0.34
MAXIMUM	1.8	8.2

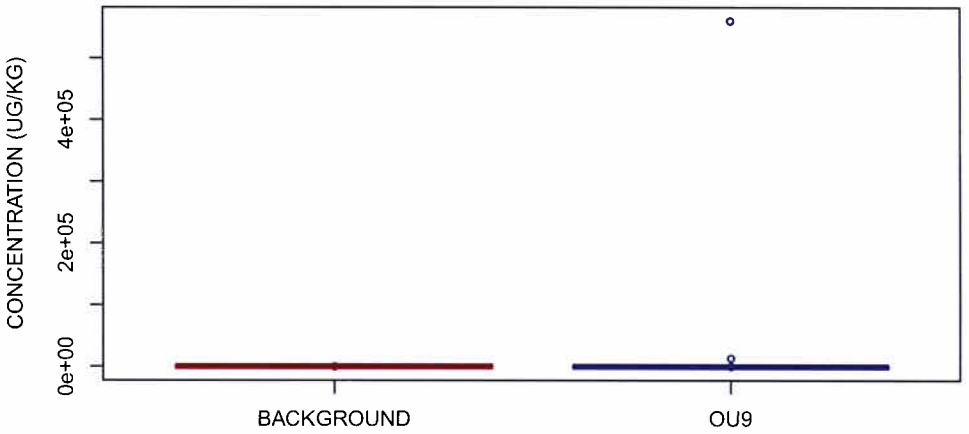
UNITS ARE MG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

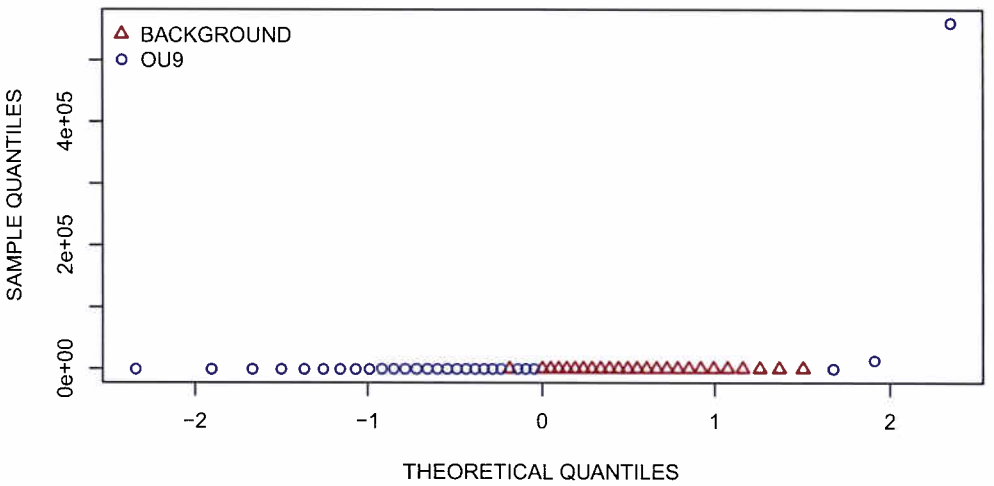
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

2-METHYLNAPHTHALENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 4 OF 20

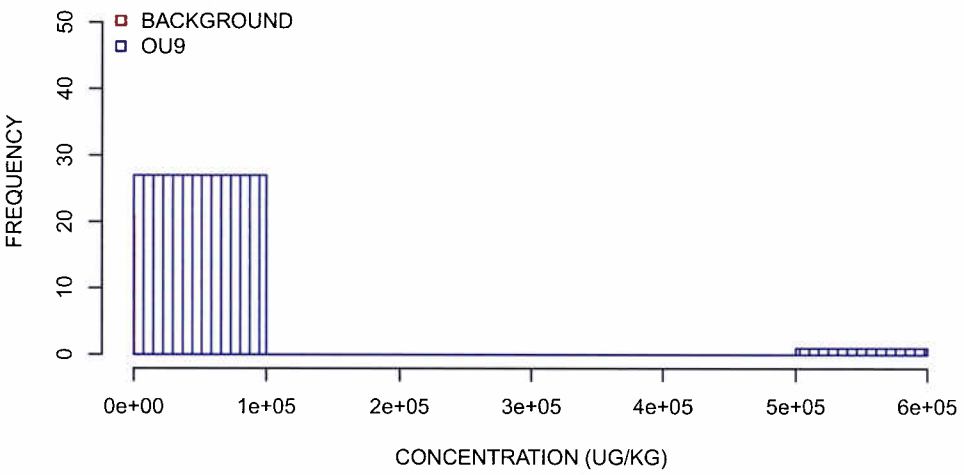
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	44	1.8
25TH PERCENTILE	180	1.8
MEDIAN	180	1.9
MEAN	180	21000
75TH PERCENTILE	200	34
MAXIMUM	220	560000

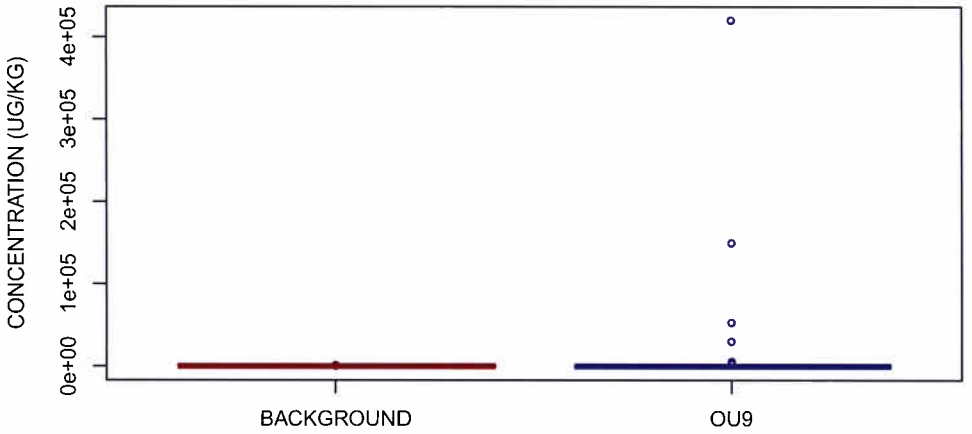
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

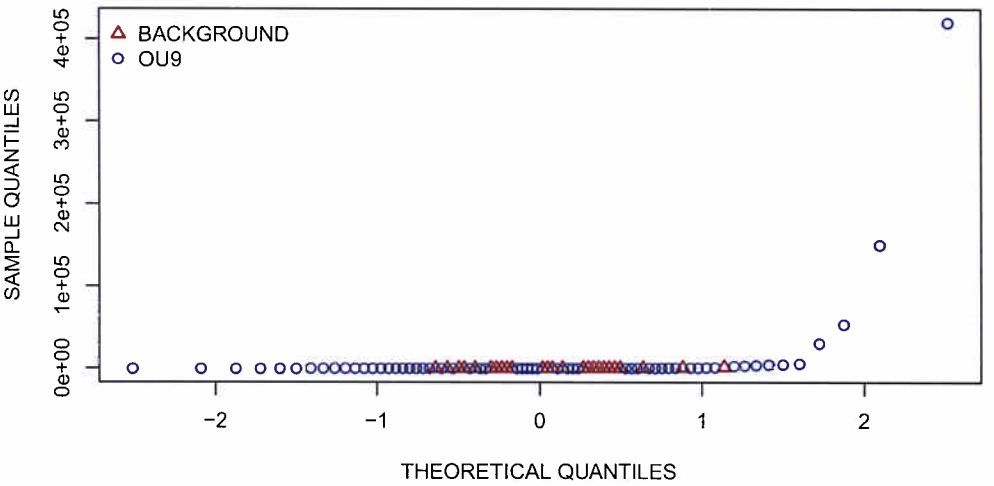
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

CHRYSENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 5 OF 20

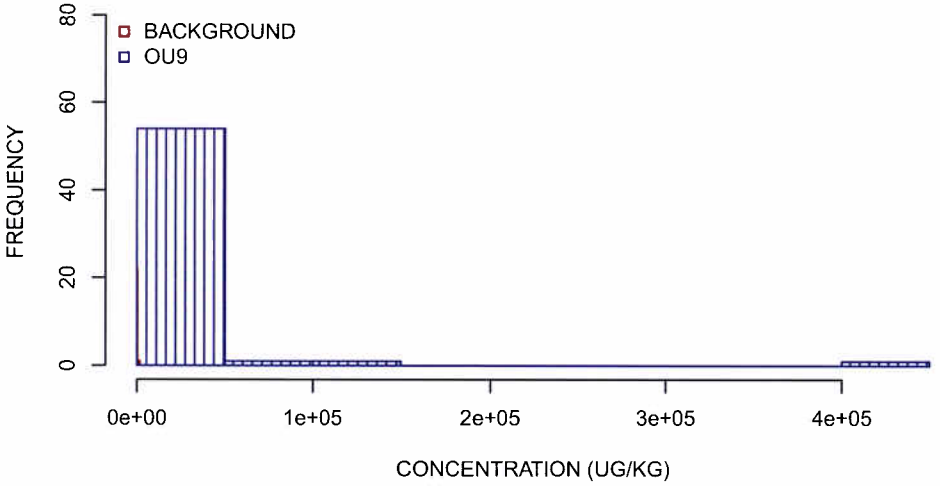
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	37	1.8
25TH PERCENTILE	61	9.3
MEDIAN	130	82
MEAN	200	12000
75TH PERCENTILE	190	660
MAXIMUM	1600	420000

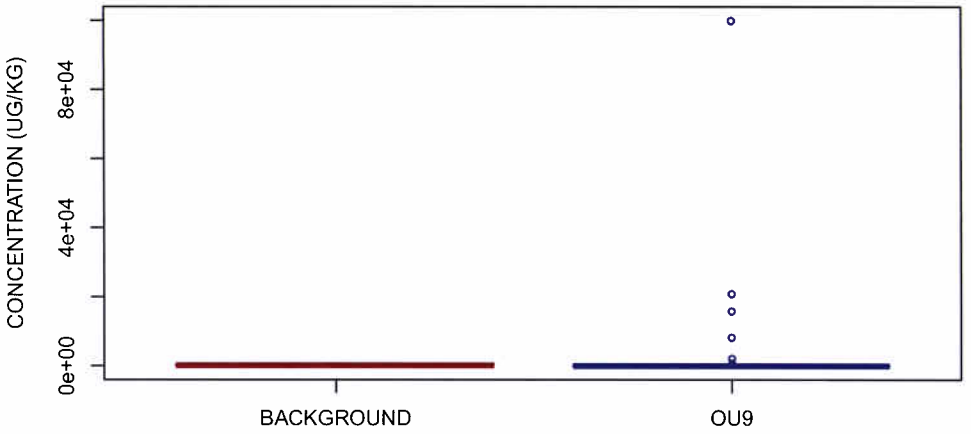
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

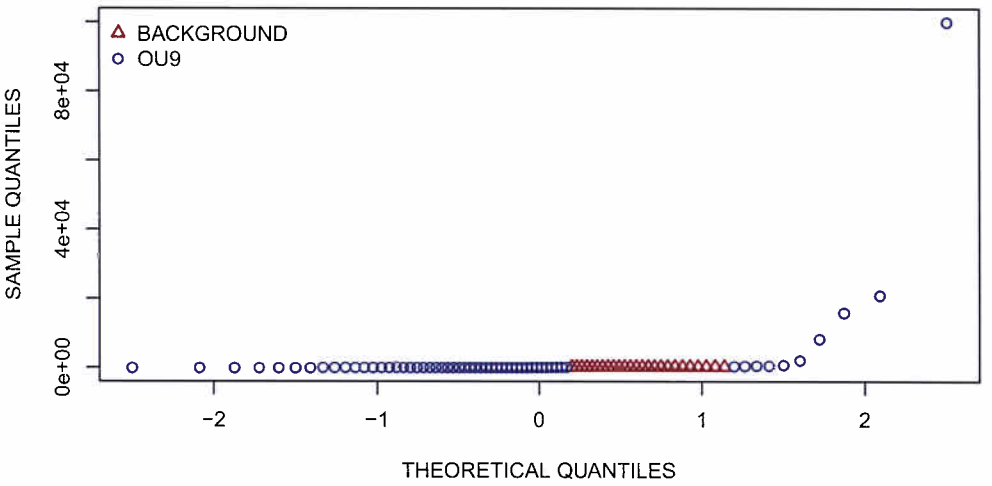
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ACENAPHTHENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 6 OF 20

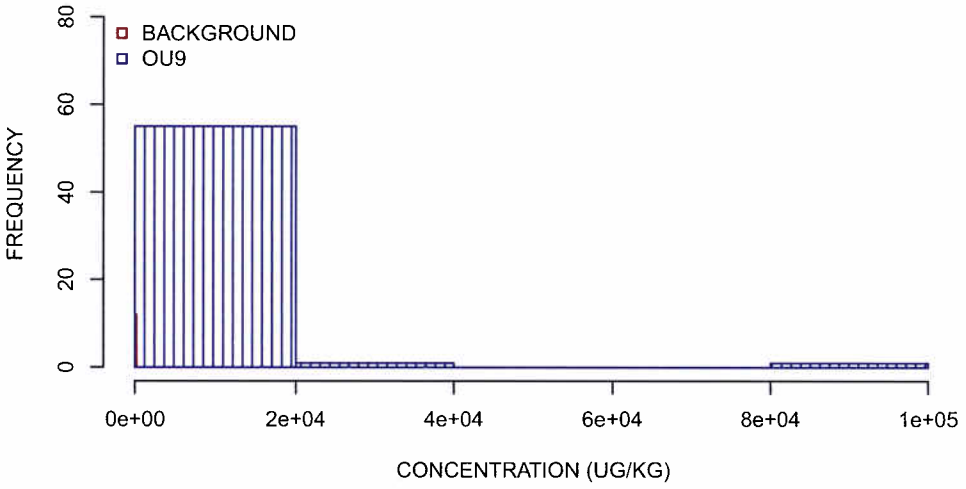
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



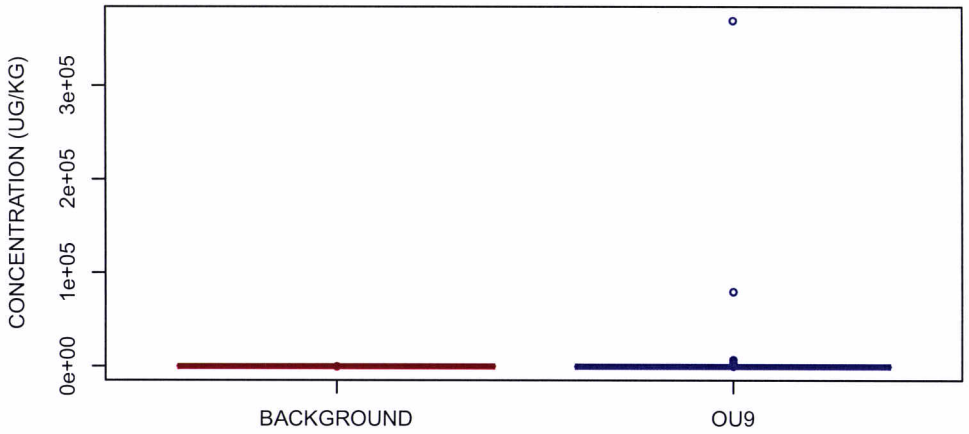
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	180	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	10
MEAN	190	2700
75TH PERCENTILE	200	76
MAXIMUM	220	1e+05

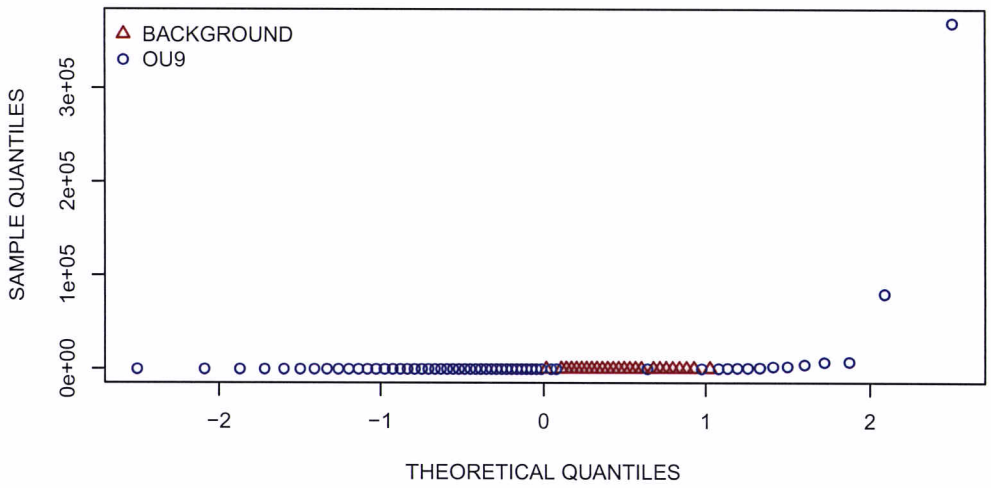
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ACENAPHTHYLENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 7 OF 20

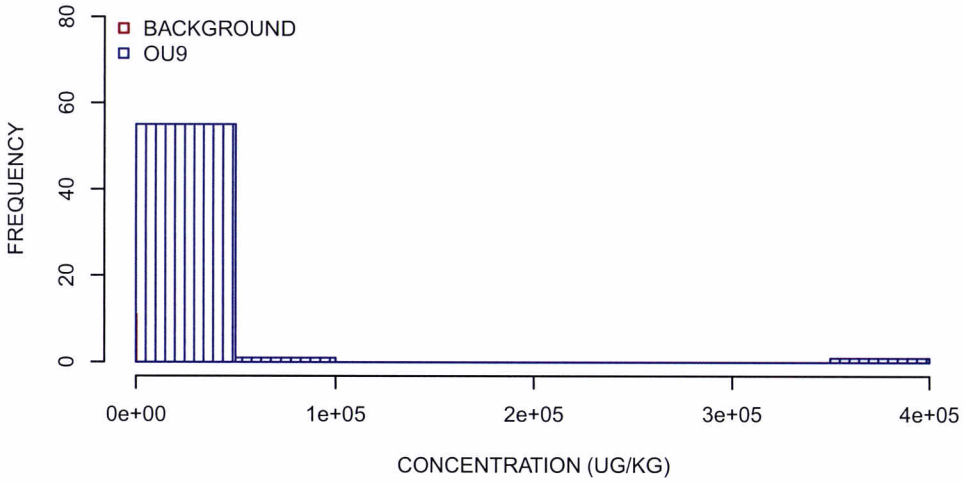
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



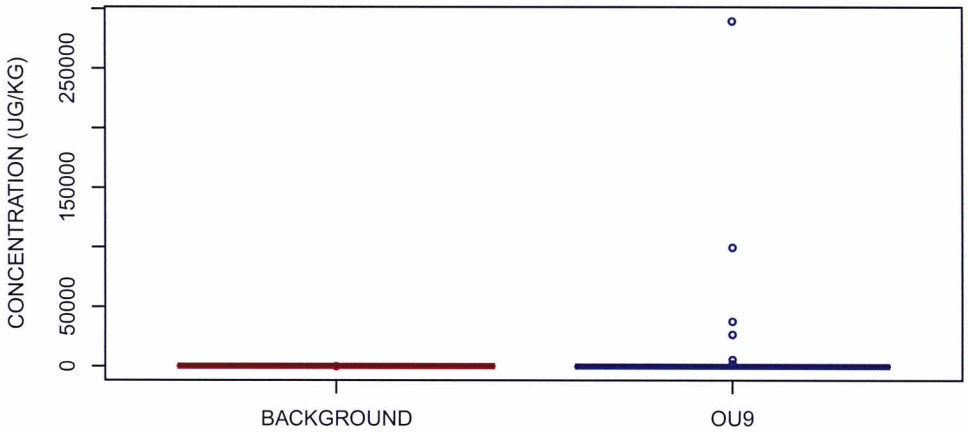
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	74	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	23
MEAN	180	8400
75TH PERCENTILE	200	80
MAXIMUM	220	370000

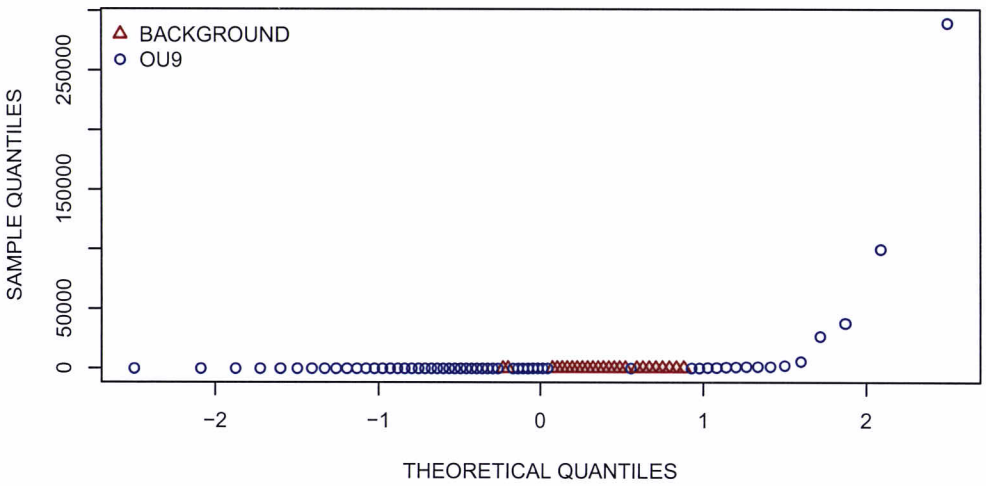
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

ANTHRACENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 8 OF 20

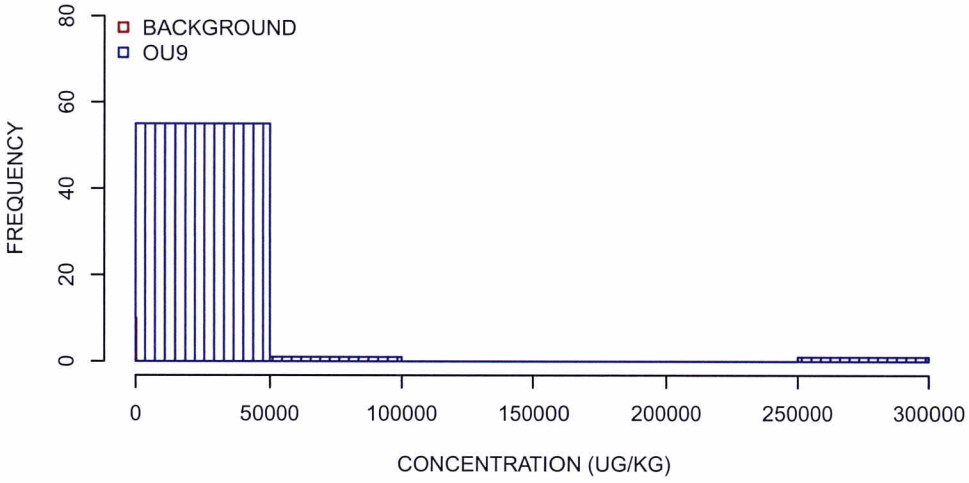
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	58	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	29
MEAN	180	8300
75TH PERCENTILE	200	300
MAXIMUM	220	290000

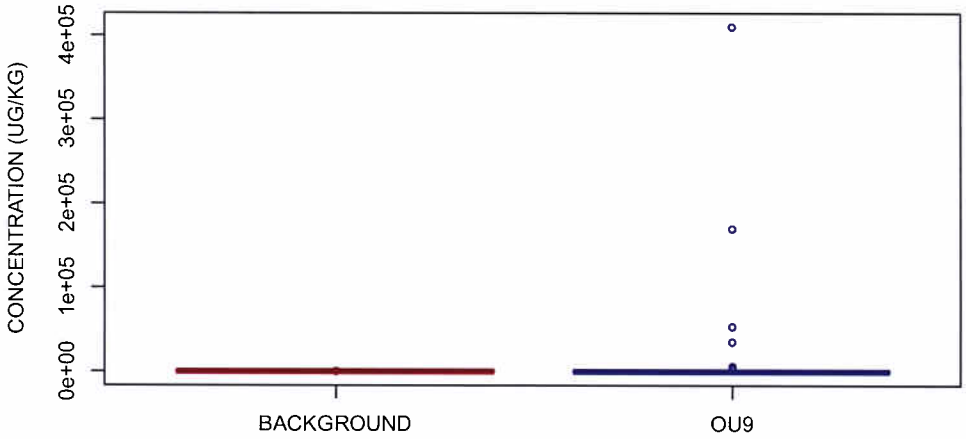
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

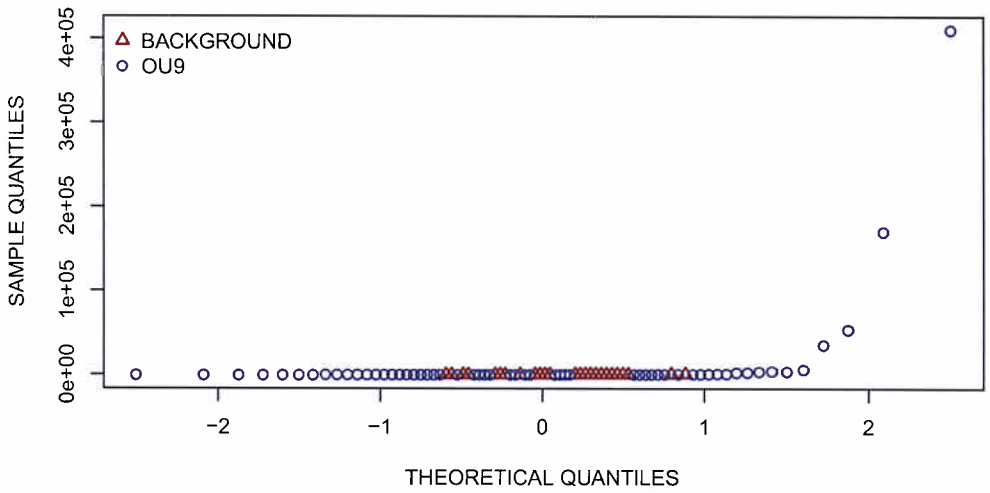
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(A)ANTHRACENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 9 OF 20

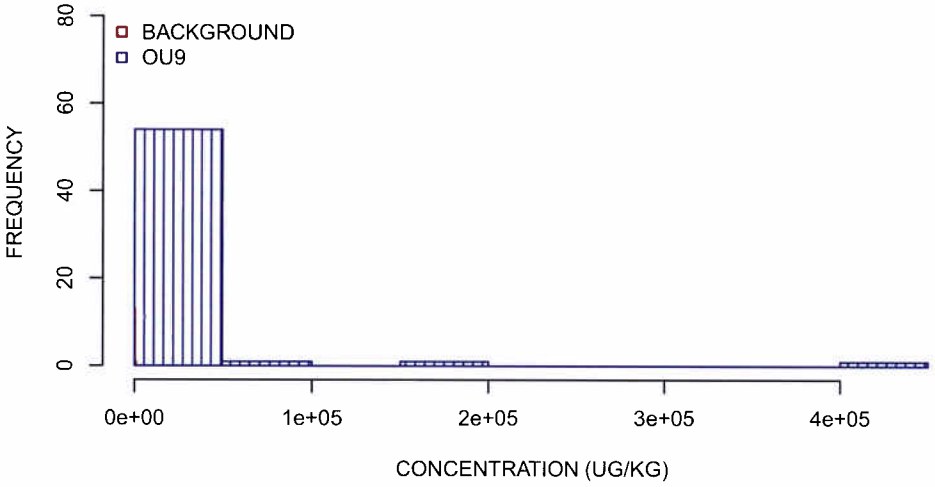
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



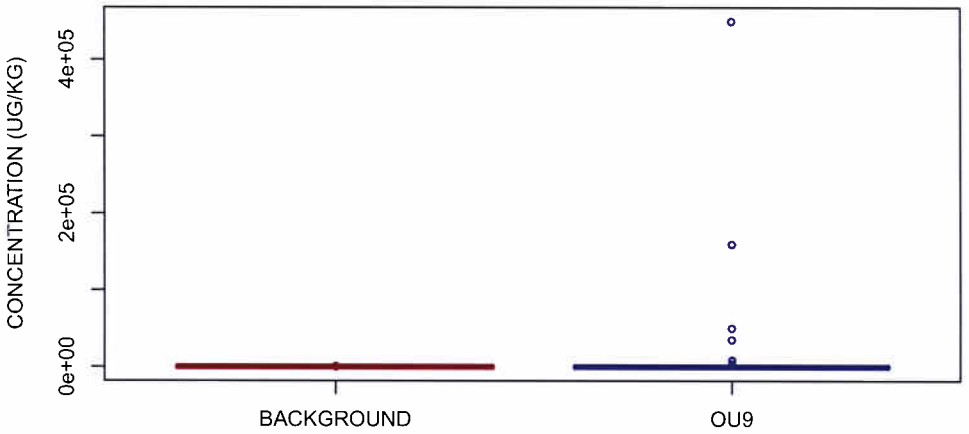
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	37	1.8
25TH PERCENTILE	69	6.2
MEDIAN	180	84
MEAN	160	12000
75TH PERCENTILE	190	670
MAXIMUM	640	410000

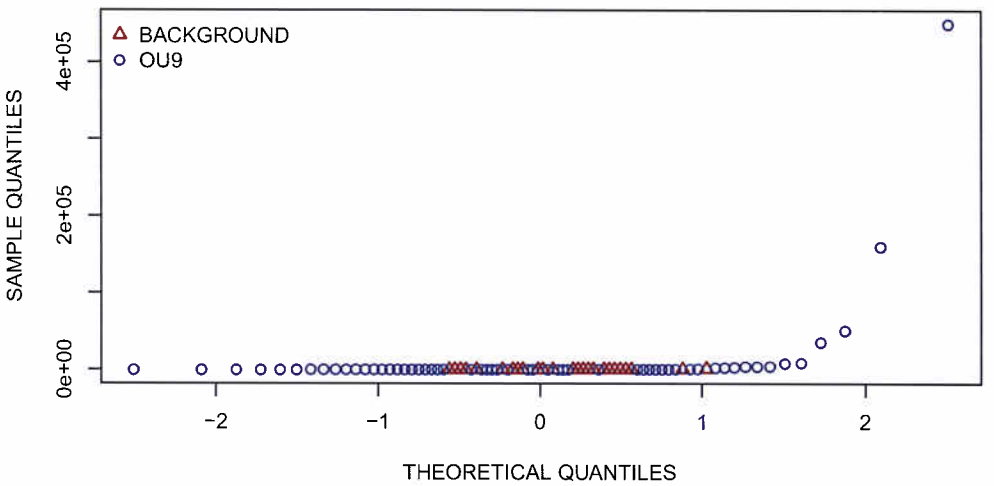
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(A)PYRENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 10 OF 20

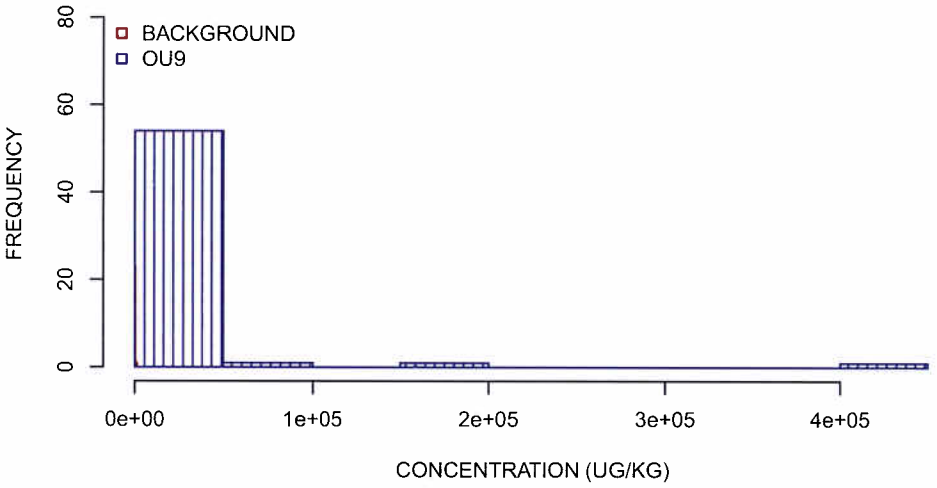
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	36	1.8
25TH PERCENTILE	85	8.5
MEDIAN	180	82
MEAN	180	13000
75TH PERCENTILE	190	500
MAXIMUM	1100	450000

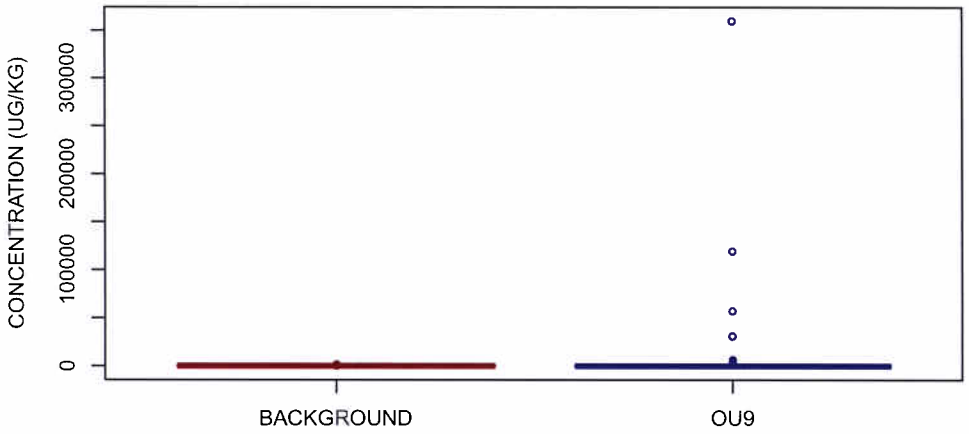
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

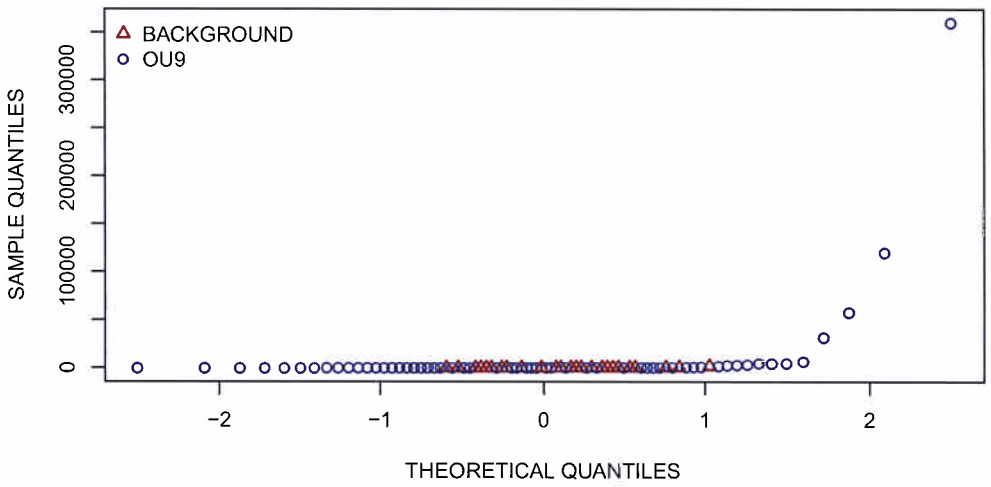
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(B)FLUORANTHENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 11 OF 20

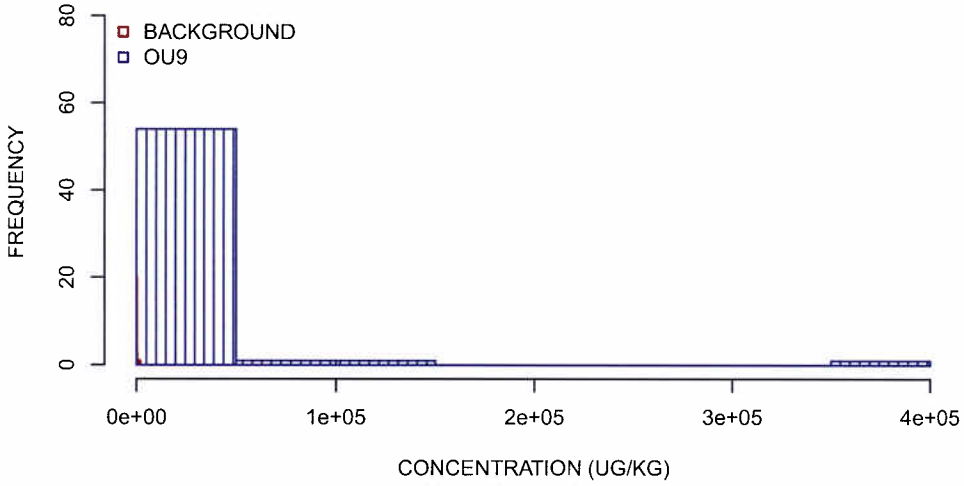
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



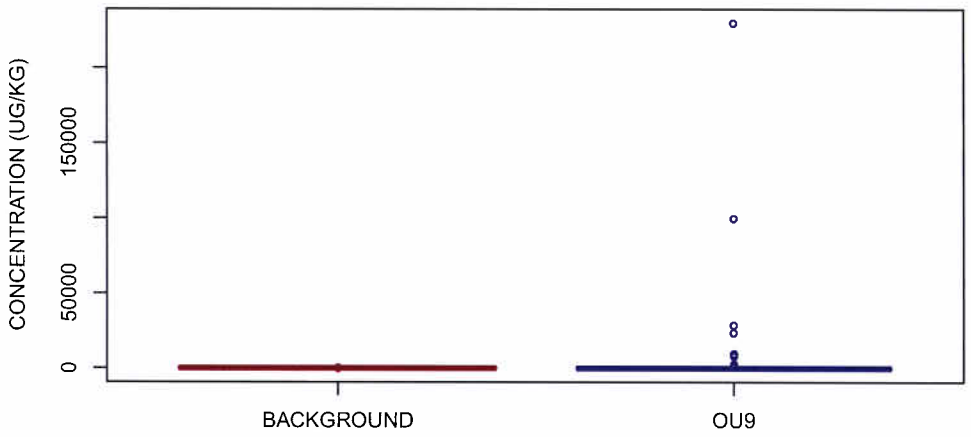
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	41	1.8
25TH PERCENTILE	62	9
MEDIAN	180	97
MEAN	220	11000
75TH PERCENTILE	200	590
MAXIMUM	1700	360000

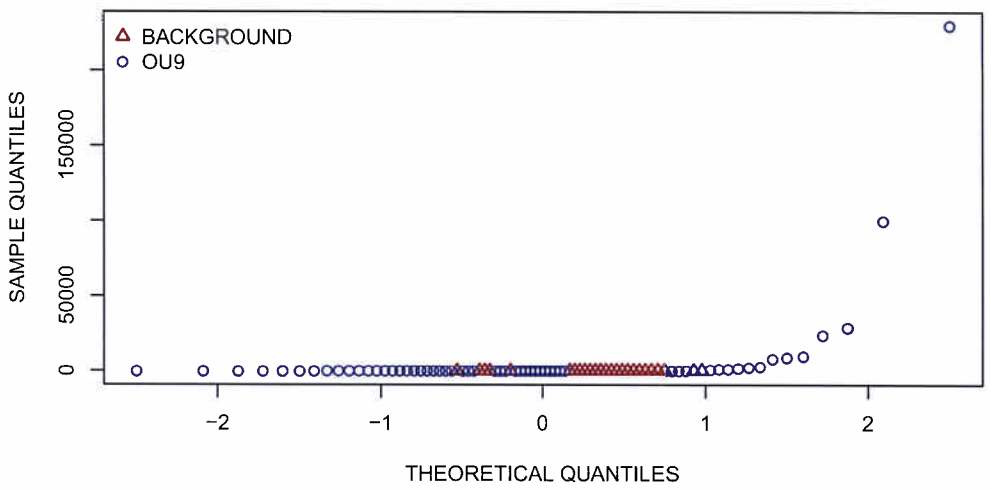
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(G,H,I)PERYLENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 12 OF 20

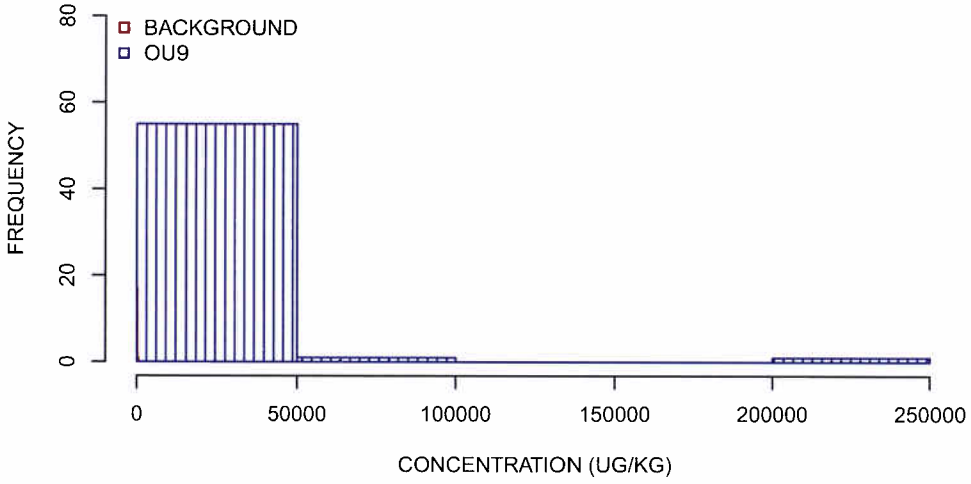
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



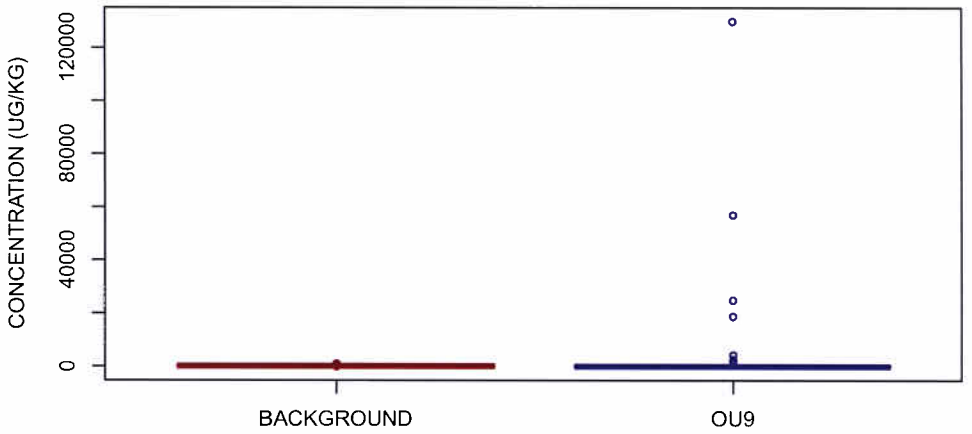
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	39	1.8
25TH PERCENTILE	180	7.5
MEDIAN	180	61
MEAN	180	7400
75TH PERCENTILE	200	250
MAXIMUM	410	230000

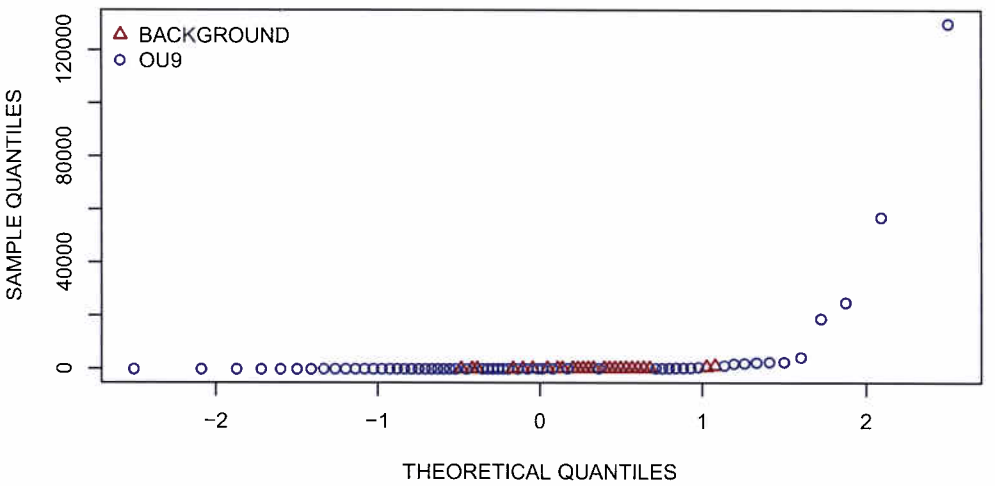
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

BENZO(K)FLUORANTHENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 13 OF 20

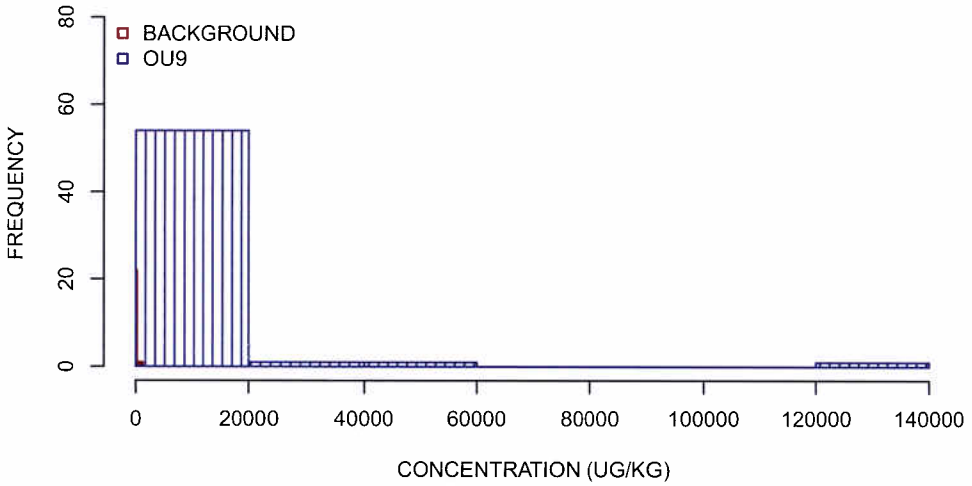
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	38	1.8
25TH PERCENTILE	150	4.3
MEDIAN	180	59
MEAN	210	4400
75TH PERCENTILE	200	290
MAXIMUM	1100	130000

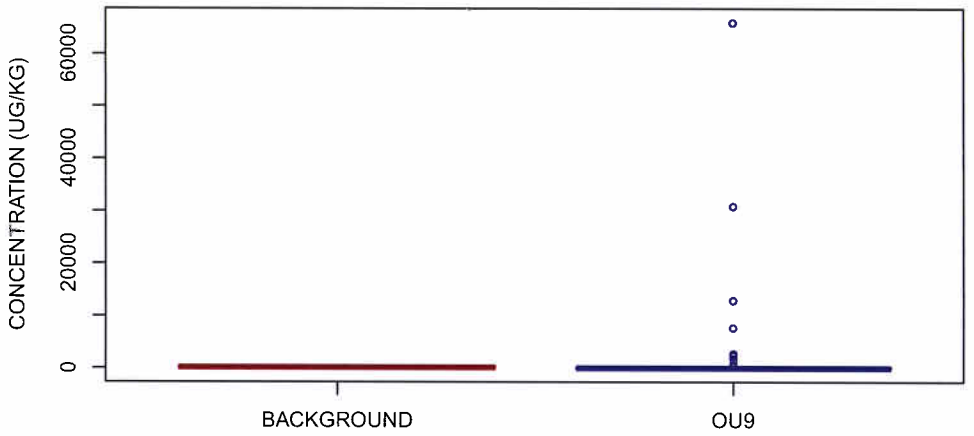
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

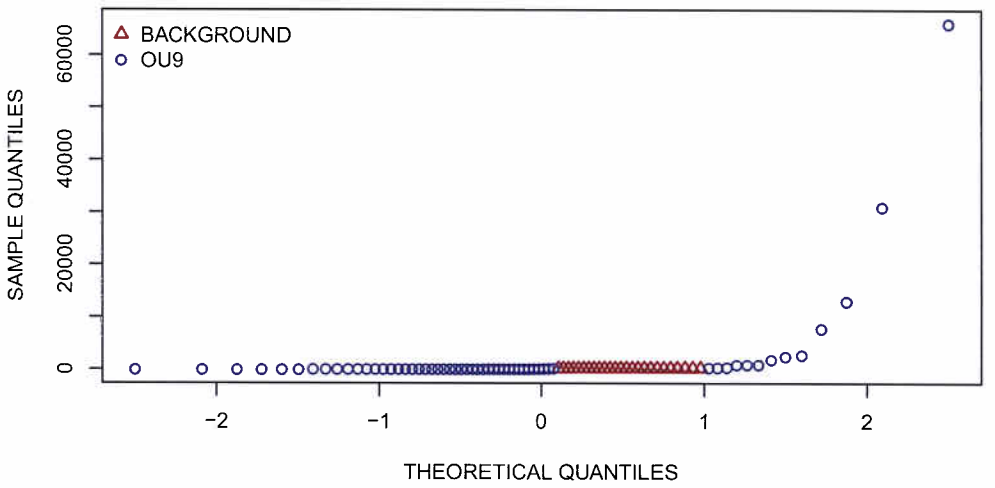
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

DIBENZO(A,H)ANTHRACENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 14 OF 20

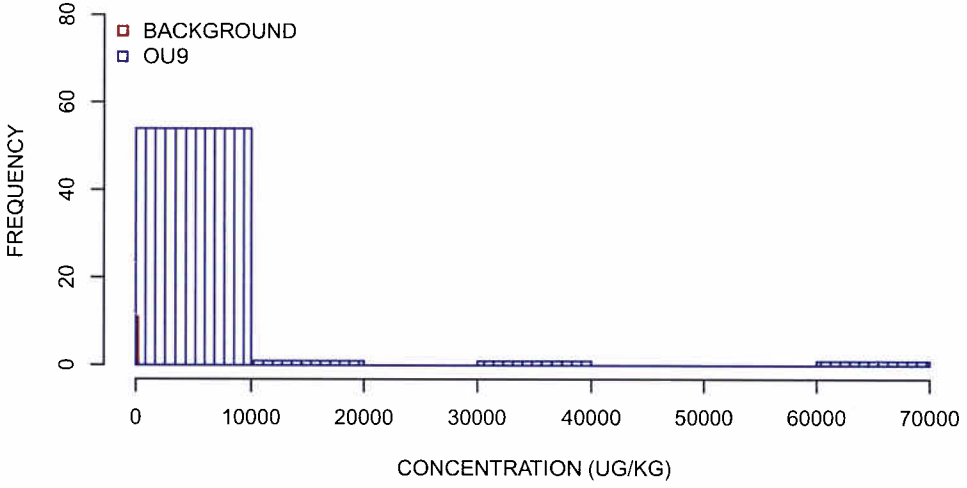
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



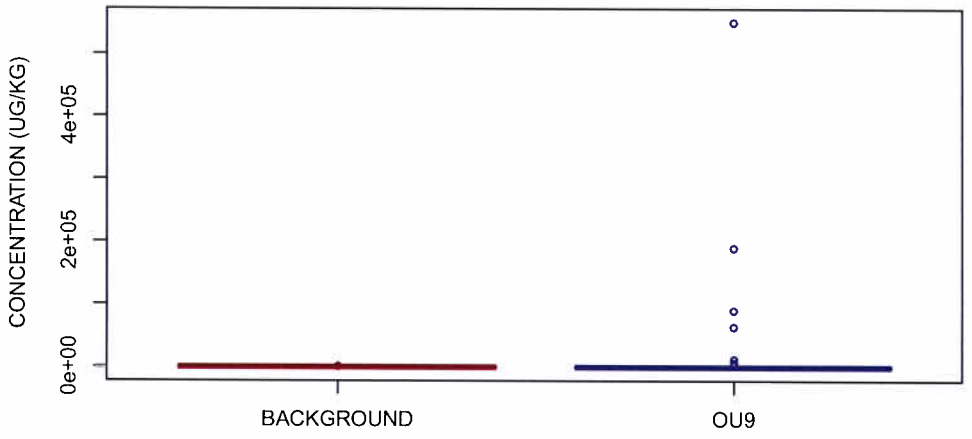
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	180	1.8
25TH PERCENTILE	180	1.9
MEDIAN	190	18
MEAN	190	2300
75TH PERCENTILE	200	130
MAXIMUM	220	66000

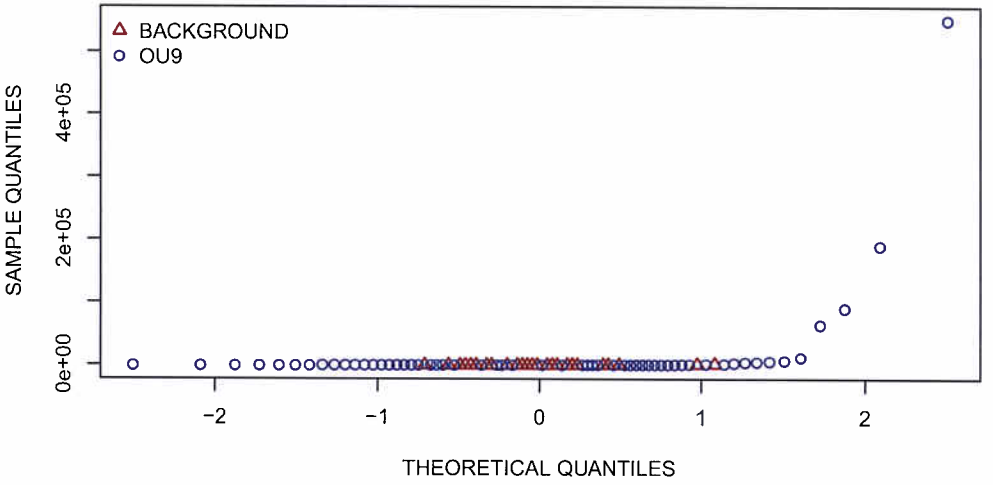
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

FLUORANTHENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 15 OF 20

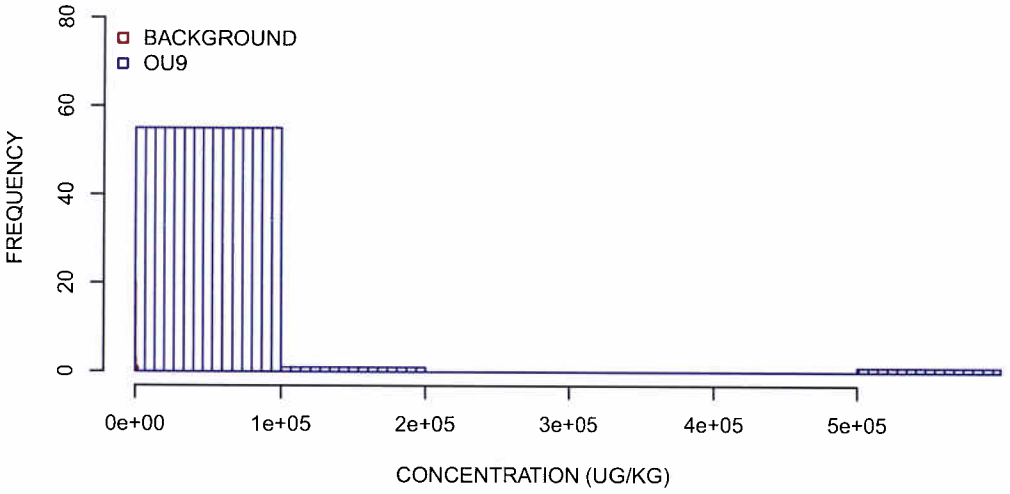
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	43	1.8
25TH PERCENTILE	86	11
MEDIAN	160	180
MEAN	250	17000
75TH PERCENTILE	200	910
MAXIMUM	1700	550000

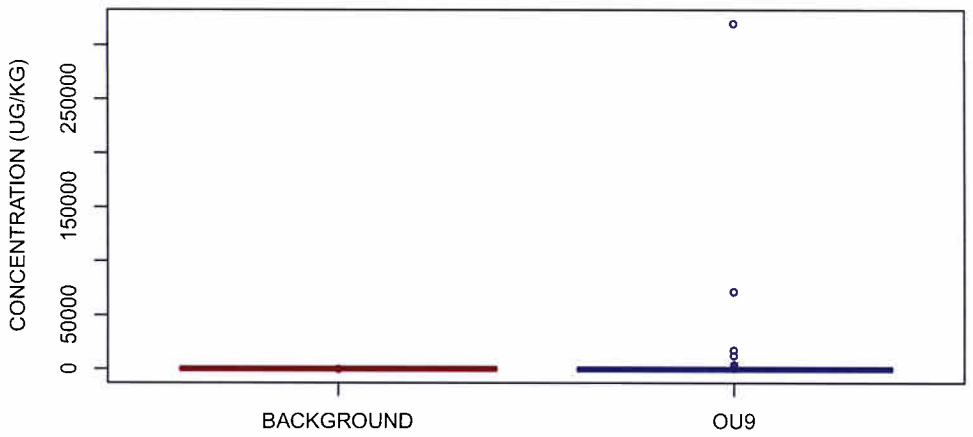
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

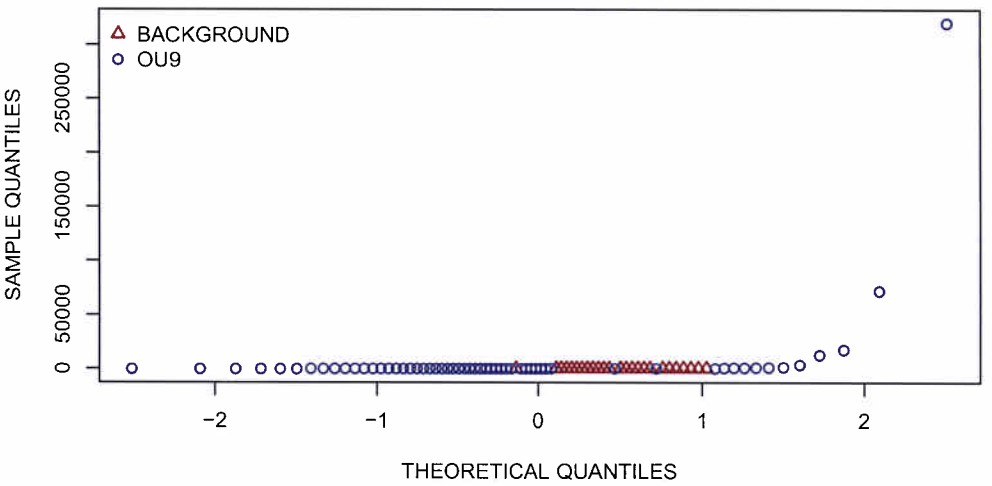
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

FLUORENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 16 OF 20

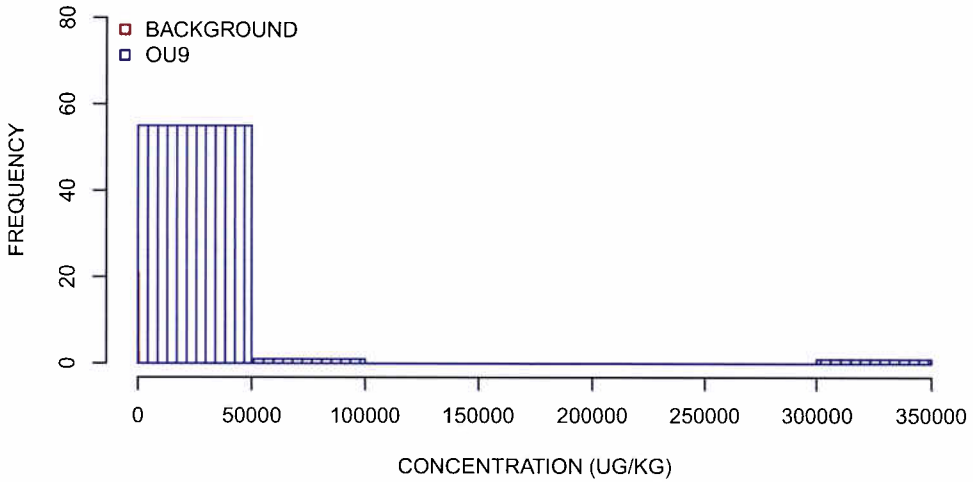
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	14
MEAN	180	7600
75TH PERCENTILE	200	160
MAXIMUM	220	320000

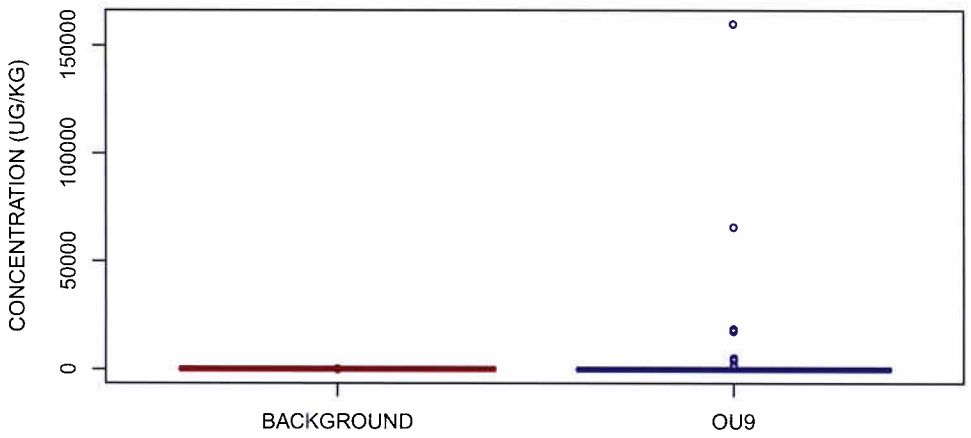
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

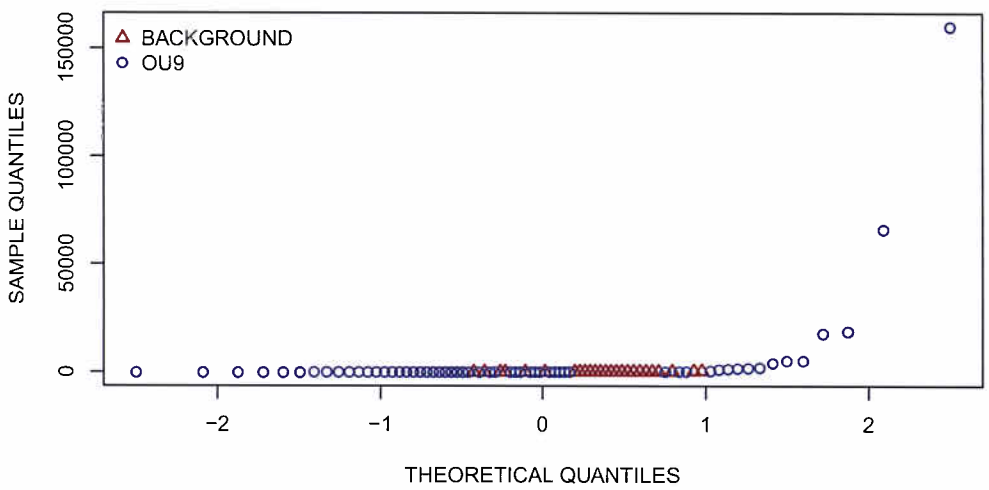
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

INDENO(1,2,3-CD)PYRENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 17 OF 20

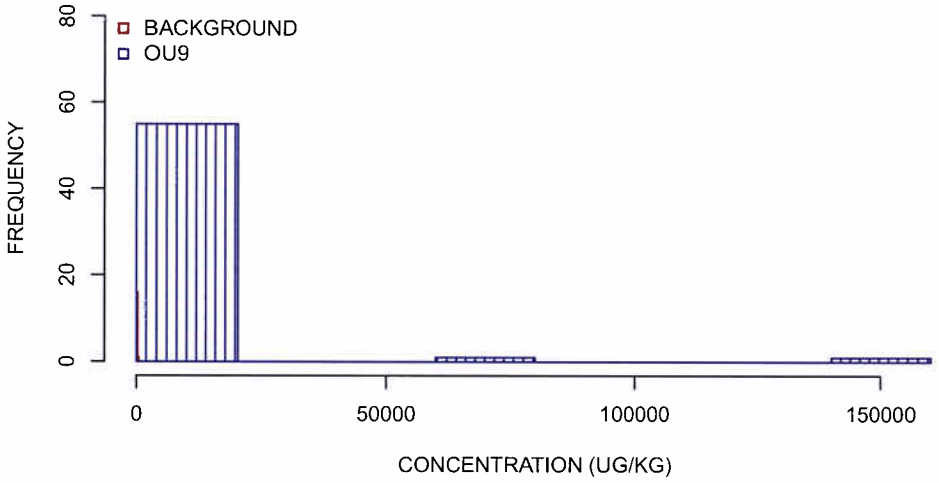
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



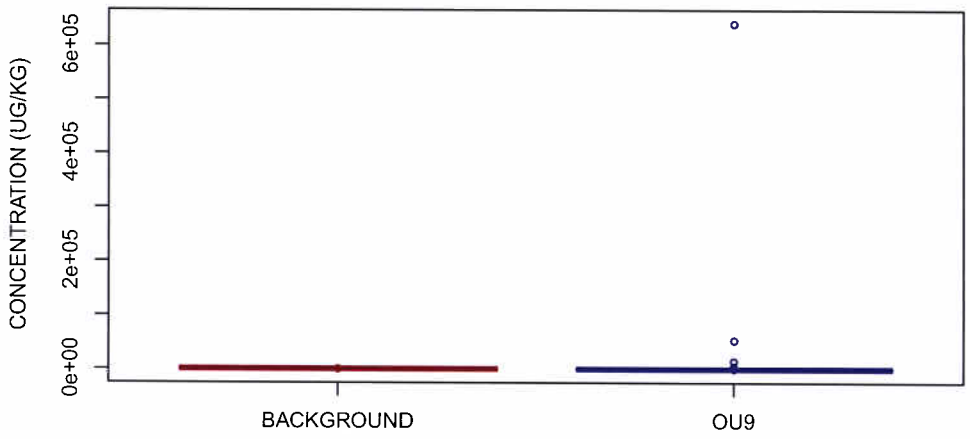
SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	38	1.8
25TH PERCENTILE	180	4.9
MEDIAN	180	52
MEAN	180	5100
75TH PERCENTILE	200	220
MAXIMUM	440	160000

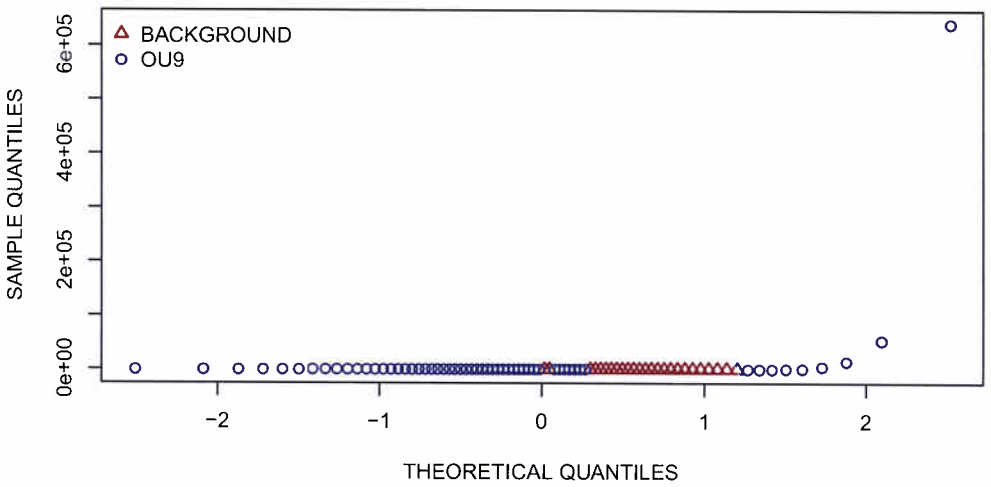
UNITS ARE UG/KG
1/2 DETECTION LIMIT USED FOR NON-DETECTS
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

NAPHTHALENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 18 OF 20

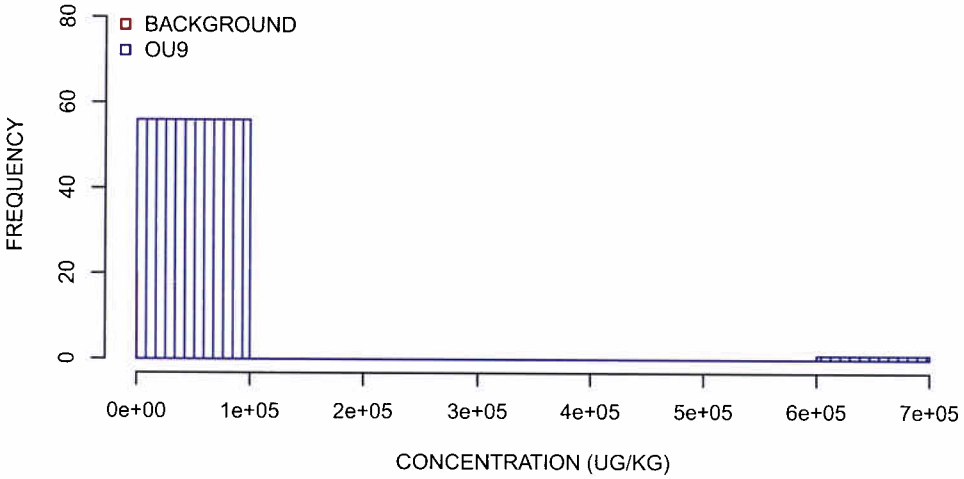
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	180	1.9
MEDIAN	180	6.8
MEAN	180	13000
75TH PERCENTILE	200	54
MAXIMUM	220	640000

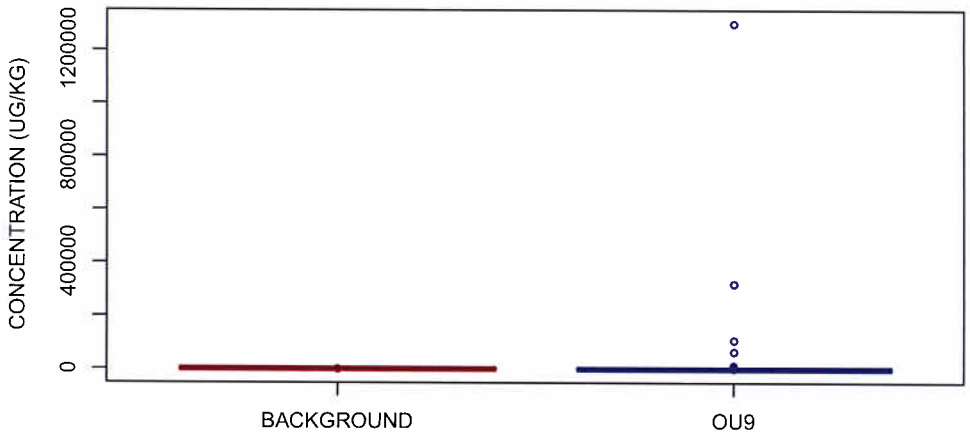
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

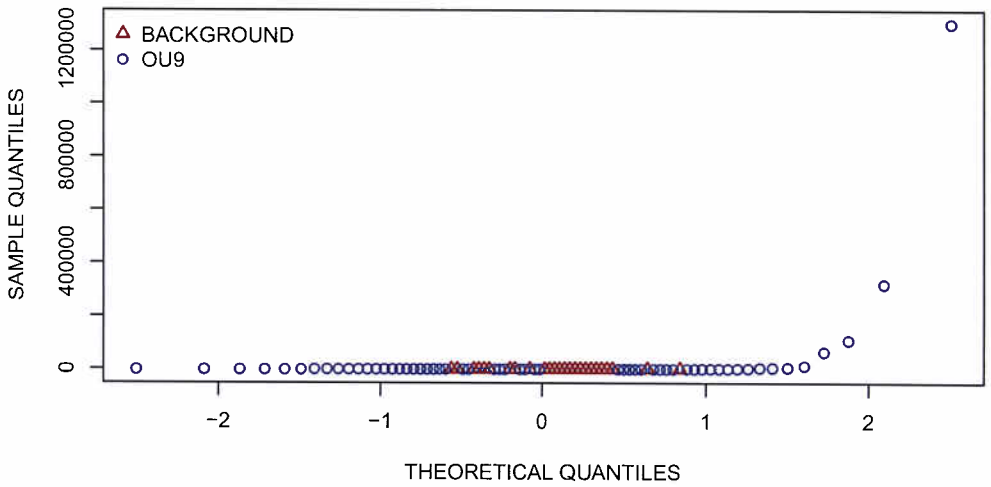
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

PHENANTHRENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 19 OF 20

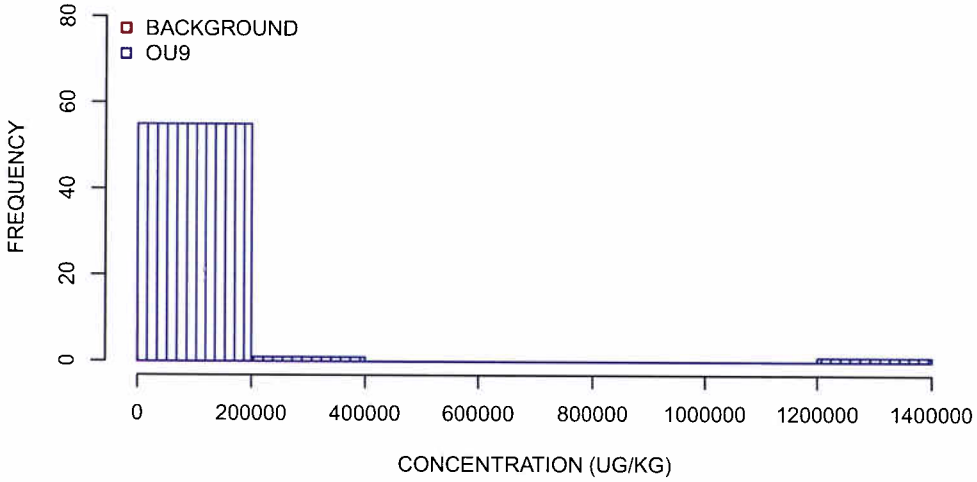
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	40	1.8
25TH PERCENTILE	91	8.7
MEDIAN	180	110
MEAN	160	32000
75TH PERCENTILE	190	600
MAXIMUM	470	1300000

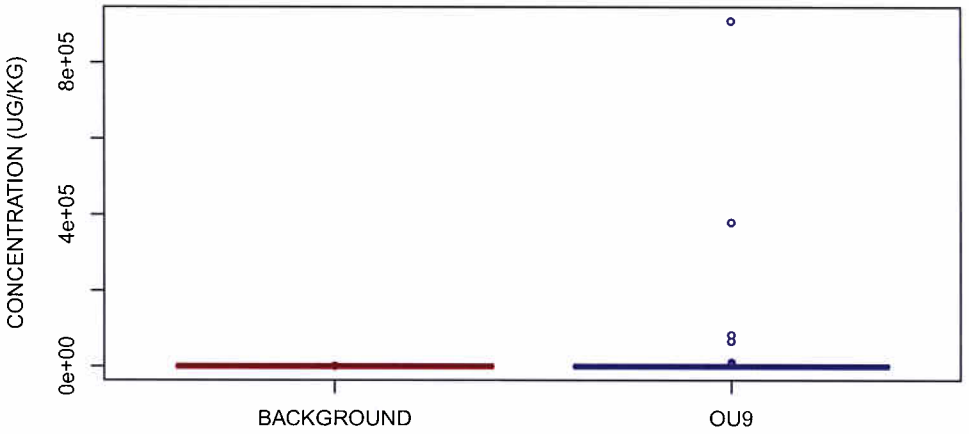
UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

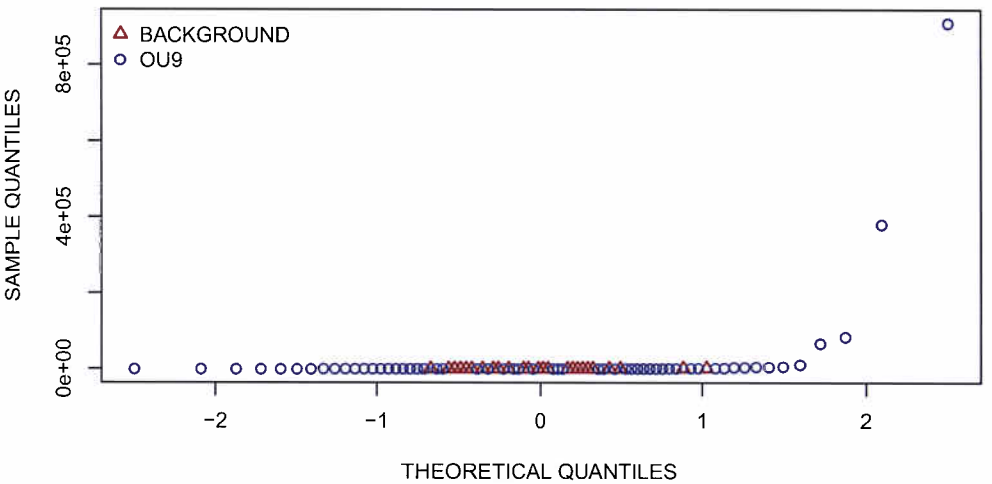
SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

PYRENE COMBINED SURFACE AND SUBSURFACE SOIL GRAPHICAL DISPLAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD
KITTERY, MAINE
FIGURE 20 OF 20

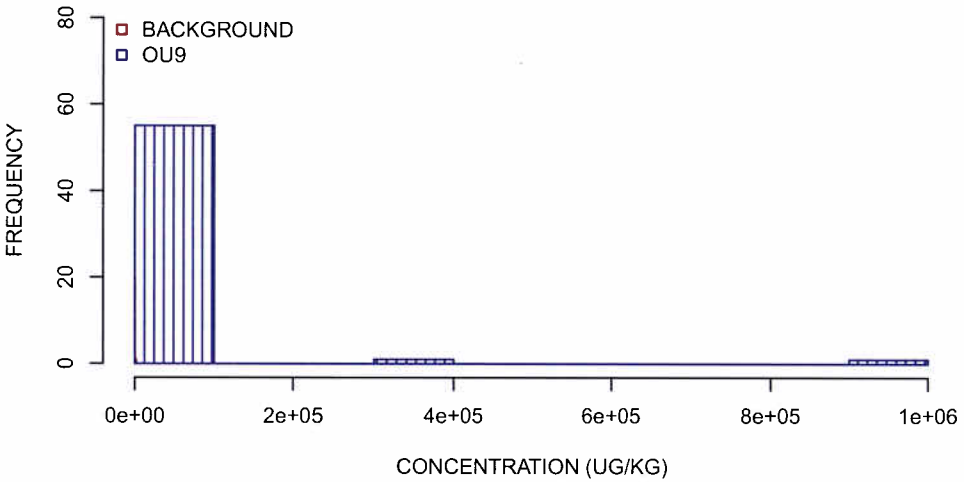
BOXPLOTS



NORMAL Q-Q PLOT



HISTOGRAMS



SUMMARY STATISTICS

	BACKGROUND	OU9
MINIMUM	42	1.8
25TH PERCENTILE	83	10
MEDIAN	140	160
MEAN	220	26000
75TH PERCENTILE	200	780
MAXIMUM	1400	910000

UNITS ARE UG/KG

1/2 DETECTION LIMIT USED FOR NON-DETECTS

SUMMARY STATISTICS ROUNDED TO TWO SIGNIFICANT FIGURES

APPENDIX C

HUMAN HEALTH RISK ASSESSMENT SUPPORTING INFORMATION

C.1 RAGS – PART D TABLES

C.2 EXPOSURE ASSESSMENT AND EXAMPLE CALCULATIONS

C.3 ADDITIONAL RISK ESTIMATES

C.1 RAGs-Part D Tables

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with surface soil during excavation activities.
		Air	OU9	Construction Workers	Adult	Inhalation	Quant	Construction workers may inhale air/dust particulates and vapors from surface soil during excavation activities.
	Subsurface Soil	Subsurface Soil	OU9	Construction Workers	Adult	Ingestion Dermal	Quant Quant	Construction workers may have contact with subsurface soil during excavation activities.
		Air	OU9	Construction Workers	Adult	Inhalation	Quant	Construction workers may inhale air/dust particulates and vapors from subsurface soil during excavation activities.
	Groundwater	Groundwater	OU9	Construction Workers	Adult	Ingestion Dermal	None None	No overburdened groundwater is present at OU9; therefore, construction workers are not expected to be exposed to groundwater.
		Air	OU9	Construction Workers	Adult	Inhalation	None	No overburdened groundwater is present at OU9; therefore, construction workers are not expected to be exposed to groundwater.
	Surface Soil	Surface Soil	OU9	Occupational Workers	Adult	Ingestion Dermal	Quant Quant	Occupational workers may have contact with surface soil while working at the site.
				Recreationl Users	Child	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
					Adult	Ingestion Dermal	Quant Quant	Recreational users may contact surface soil while at the site.
Future	Surface Soil	Surface Soil	OU9	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
Current/Future	Surface Soil	Air	OU9	Occupational Workers	Adult	Ingestion Dermal	Quant Quant	Occupational workers may inhale air/dust particulates and vapors while working at the site. surface soil while working at the site.
				Recreational Users	Adolescent Adult	Inhalation Inhalation	Quant Quant	Recreational users may inhale air/dust particulates and vapors while at the site.
Future	Surface Soil	Air	OU9	Residents	Child	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
					Adult	Ingestion Dermal	Quant Quant	Although a future residential scenario is considered unlikely at the site this scenario is included to aid in future risk management decisions.
Current/Future	Groundwater	Groundwater	OU9	Occupational Workers	Adult	Ingestion Dermal	None None	Occupational Workers are not expected to have contact with groundwater.
				Recreationl Users	Child	Ingestion Dermal	None None	Recreational Users are not expected to have contact with groundwater.
					Adult	Ingestion Dermal	None None	
Future	Groundwater	Groundwater	OU9	Residents	Child	Ingestion Dermal	None None	Residents are not expected to have contact with groundwater.
					Adult	Ingestion Dermal	None None	
Current/Future	Groundwater	Air	OU9	Occupational Workers	Adult	Inhalation	None	Occupational Workers are not expected to have contact with groundwater.
				Recreationl Users	Adult	Inhalation	None	Recreational Users are not expected to have contact with groundwater.

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	Groundwater	Air	OU9	Recreationl Users	Child	Inhalation	None	Recreational Users are not expected to have contact with groundwater.
Future	Groundwater	Air	OU9	Residents	Adult	Inhalation	None	Residents are not expected to have contact with groundwater.
					Child	Inhalation	None	

Notes:
Quant - Quantitative.

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

Table No.

2.1 Residential Direct Contact With Entire Site Surface Soil
2.2 Residential Direct Contact With Entire Site Subsurface Soil

TABLE 2.1
RESIDENTIAL CONTACT WITH ENTIRE SITE SURFACE SOIL
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	Screening Toxicity Value[5]	Potential ARAR/TBC	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
OU9	**METALS**														
	7440-36-0	Antimony	0.32 J	2.3 J	MG/KG	OU9-SS-24-0002	12/19	0.15 - 1	2.3	Site Within Background	3.1 N	NA	NA	No	BSL
	7439-92-1	Lead	18.8 J	6650 J	MG/KG	OU9-SS-12-0002-D	19/19	-	6650	Site Within Background	**400**	NA	NA	No	BKG
	7439-97-6	Mercury	0.011	1.1	MG/KG	OU9-SS-18-0002	19/19	-	1.1	Site Greater Background	2.3 N[7]	NA	NA	No	BSL
	POLYCYCLIC AROMATIC HYDROCARBONS														
	91-57-6	2-Methylnaphthalene	5.9 J	140 J	UG/KG	OU9-SS-19-0002	7/10	3.5 - 4	140	Site Greater Background	31000 N	NA	NA	No	BSL
	83-32-9	Acenaphthene	4.7	530	UG/KG	OU9-SS-18-0002	15/19	3.5 - 4	530	Site Greater Background	340000 N	NA	NA	No	BSL
	208-96-8	Acenaphthylene	4.4	2100 J	UG/KG	OU9-SS-22-0002	16/19	3.7 - 4	2100	Site Greater Background	340000 N[8]	NA	NA	No	BSL
	120-12-7	Anthracene	4.4	2400	UG/KG	OU9-SS-19-0002	17/19	3.7 - 3.8	2400	Site Greater Background	1700000 N	NA	NA	No	BSL
	56-55-3	**Benzo(a)anthracene**	10	7500 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	7500	Site Greater Background	**150 C**	NA	NA	**Yes**	ASL
	50-32-8	**Benzo(a)pyrene**	11	7400 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	7400	Site Greater Background	**15 C**	NA	NA	**Yes**	ASL
	205-99-2	Benzo(b)fluoranthene	9.5 J	8500 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	8500	Site Within Background	**150 C**	NA	NA	No	BKG
	191-24-2	Benzo(g,h,i)perylene	7.5	3600 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	3600	Site Greater Background	170000 N[9]	NA	NA	No	BSL
	207-08-9	**Benzo(k)fluoranthene**	4.3	4800 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	4800	Site Greater Background	**1500 C**	NA	NA	**Yes**	ASL
	218-01-9	Chrysene	11	8700 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	8700	Site Within Background	15000 C	NA	NA	No	BSL
	53-70-3	**Dibenzo(a,h)anthracene**	4.3	1600 J	UG/KG	OU9-SS-22-0002	16/19	3.7 - 4	1600	Site Greater Background	**15 C**	NA	NA	**Yes**	ASL
	206-44-0	Fluoranthene	3 J	11000 J	UG/KG	OU9-SS-22-0002	19/19	-	11000	Site Greater Background	230000 N	NA	NA	No	BSL
	86-73-7	Fluorene	8	1100	UG/KG	OU9-SS-19-0002	15/19	3.5 - 4	1100	Site Greater Background	230000 N	NA	NA	No	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	5.2	3500 J	UG/KG	OU9-SS-22-0002	18/19	3.8 - 3.8	3500	Site Greater Background	**150 C**	NA	NA	**Yes**	ASL
	91-20-3	Naphthalene	2.7 J	240 J	UG/KG	OU9-SS-19-0002	15/19	3.5 - 4	240	Site Greater Background	3600 C	NA	NA	No	BSL
	85-01-8	Phenanthrene	11	5500	UG/KG	OU9-SS-19-0002	18/19	3.8 - 3.8	5500	Site Greater Background	170000 N[9]	NA	NA	No	BSL
	129-00-0	Pyrene	2.2 J	9700 J	UG/KG	OU9-SS-22-0002	19/19	-	9700	Site Greater Background	170000 N	NA	NA	No	BSL

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.

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 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - United States Environmental Protection Agency Regions 3, 6, and 9. (November, 2010). Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - The value presented is for mercuric chloride (and other mercury salts).
8 - Acenapthene value was used as a surrogate.
9 - Pyrene value was used as a surrogate.

Associated Samples

OU9-SS-01-0002	OU9-SS-12-0002-D	OU9-SS-23-0002
OU9-SS-02-0002	OU9-SS-16-0002	OU9-SS-24-0002
OU9-SS-03-0002	OU9-SS-17-0002	OU9-SS-25-0002
OU9-SS-04-0002	OU9-SS-18-0002	
OU9-SS-05-0002	OU9-SS-19-0002	
OU9-SS-06-0002	OU9-SS-20-0002	
OU9-SS-10-0002	OU9-SS-21-0002	
OU9-SS-11-0002	OU9-SS-22-0002	
OU9-SS-12-0002	OU9-SS-22-0002-D	

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirements To Be Considered
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level

TABLE 2.2
RESIDENTIAL CONTACT WITH ENTIRE SITE SUBSURFACE SOIL
OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	CAS Number	Chemical	Minimum Concentration[1]	Maximum Concentration[1]	Units	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects[2]	Concentration Used for Screening[3]	Range of Background Concentrations[4]	Screening Toxicity Value[5]	Potential ARAR/TBC	Potential ARAR/TBC Source	COPC Flag	Rationale for Contaminant Deletion or Selection[6]
OU9	**METALS**														
	7440-36-0	Antimony	0.22 J	3.7	MG/KG	OU9-SB-13-0406	16/38	0.29 - 1.1	3.7	Site Within Background	**3.1 N**	NA	NA	No	BKG
	7439-92-1	Lead	2.4 J	1180	MG/KG	OU9-SB-12-0204	38/38	-	1180	Site Within Background	**400**	NA	NA	No	BKG
	7439-97-6	**Mercury**	0.0025 J	8.2	MG/KG	OU9-SB-22-0205	34/38	0.0048 - 0.026	8.2	Site Greater Background	**2.3 N[7]**	NA	NA	**Yes**	ASL
	POLYCYCLIC AROMATIC HYDROCARBONS														
	91-57-6	**2-Methylnaphthalene**	16 J	560000 J	UG/KG	OU9-SB-22-0508	4/18	3.5 - 4	560000	Site Greater Background	**31000 N**	NA	NA	**Yes**	ASL
	83-32-9	Acenaphthene	4.5 J	100000	UG/KG	OU9-SB-22-0508	18/38	3.5 - 4	100000	Site Greater Background	340000 N	NA	NA	No	BSL
	208-96-8	**Acenaphthylene**	5.5 J	370000	UG/KG	OU9-SB-22-0508	24/38	3.5 - 3.8	370000	Site Greater Background	**340000 N[8]**	NA	NA	**Yes**	ASL
	120-12-7	Anthracene	4.1	290000	UG/KG	OU9-SB-22-0508	25/38	3.5 - 3.8	290000	Site Greater Background	1700000 N	NA	NA	No	BSL
	56-55-3	**Benzo(a)anthracene**	3.1 J	410000 J	UG/KG	OU9-SB-22-0508	29/38	3.5 - 3.8	410000	Site Greater Background	**150 C**	NA	NA	**Yes**	ASL
	50-32-8	**Benzo(a)pyrene**	2.4 J	450000	UG/KG	OU9-SB-22-0508	29/38	3.5 - 3.8	450000	Site Greater Background	**15 C**	NA	NA	**Yes**	ASL
	205-99-2	**Benzo(b)fluoranthene**	3.8	360000	UG/KG	OU9-SB-22-0508	30/38	3.5 - 3.8	360000	Site Greater Background	**150 C**	NA	NA	**Yes**	ASL
	191-24-2	**Benzo(g,h,i)perylene**	2.3 J	230000	UG/KG	OU9-SB-22-0508	30/38	3.5 - 3.8	230000	Site Greater Background	**170000 N[9]**	NA	NA	**Yes**	ASL
	207-08-9	**Benzo(k)fluoranthene**	2.5 J	130000 J	UG/KG	OU9-SB-22-0508	28/38	3.5 - 3.8	130000	Site Greater Background	**1500 C**	NA	NA	**Yes**	ASL
	218-01-9	**Chrysene**	3.5 J	420000	UG/KG	OU9-SB-22-0508	29/38	3.5 - 3.8	420000	Site Greater Background	**15000 C**	NA	NA	**Yes**	ASL
	53-70-3	**Dibenzo(a,h)anthracene**	3.5 J	66000	UG/KG	OU9-SB-22-0508	24/38	3.5 - 3.8	66000	Site Greater Background	**15 C**	NA	NA	**Yes**	ASL
	206-44-0	**Fluoranthene**	3.1 J	550000	UG/KG	OU9-SB-22-0508	33/38	3.5 - 3.8	550000	Site Greater Background	**230000 N**	NA	NA	**Yes**	ASL
	86-73-7	**Fluorene**	2.5 J	320000	UG/KG	OU9-SB-22-0508	23/38	3.5 - 3.8	320000	Site Greater Background	**230000 N**	NA	NA	**Yes**	ASL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	1.9 J	160000	UG/KG	OU9-SB-22-0508	27/38	3.5 - 3.8	160000	Site Greater Background	**150 C**	NA	NA	**Yes**	ASL
	91-20-3	**Naphthalene**	2.7 J	640000	UG/KG	OU9-SB-22-0508	23/38	3.5 - 3.9	640000	Site Greater Background	**3600 C**	NA	NA	**Yes**	ASL
	85-01-8	**Phenanthrene**	3.5	1300000	UG/KG	OU9-SB-22-0508	33/38	3.5 - 3.8	1300000	Site Greater Background	**170000 N[9]**	NA	NA	**Yes**	ASL
	129-00-0	**Pyrene**	2.9 J	910000 J	UG/KG	OU9-SB-22-0508	33/38	3.5 - 3.8	910000	Site Greater Background	**170000 N**	NA	NA	**Yes**	ASL

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.

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 - To determine whether chemical concentrations were within background levels, a statistical analysis was conducted using the site and background datasets.
5 - United States Environmental Protection Agency Regions 3, 6, and 9. (November, 2010). Regional Screening Levels for Chemical Contaminants at Superfund Sites. http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm
6 - The chemical is selected as a COPC if the maximum detected concentration exceeds the risk-based COPC screening level and is statistically determined to be greater than site background.
7 - The value presented is for mercuric chloride (and other mercury salts).
8 - Acenapthene value was used as a surrogate.
9 - Pyrene value was used as a surrogate.

Associated Samples

OU9-SB-01-0204	OU9-SB-15-0810
OU9-SB-04-0205	OU9-SB-16-0205
OU9-SB-04-0508	OU9-SB-16-0508
OU9-SB-04-0508-D	OU9-SB-17-0205
OU9-SB-05-0205	OU9-SB-17-0205-D
OU9-SB-05-0507	OU9-SB-17-0508
OU9-SB-06-0205	OU9-SB-18-0205
OU9-SB-06-0508	OU9-SB-18-0508
OU9-SB-10-0608	OU9-SB-18-0508-D
OU9-SB-11-0206	OU9-SB-19-0205
OU9-SB-11-0206-D	OU9-SB-19-0508
OU9-SB-12-0204	OU9-SB-20-0205
OU9-SB-12-0406	OU9-SB-20-0508
OU9-SB-12-0608	OU9-SB-21-0205
OU9-SB-13-0406	OU9-SB-21-0508
OU9-SB-13-0608	OU9-SB-22-0205
OU9-SB-14-0406	OU9-SB-22-0508
OU9-SB-14-0608	OU9-SB-23-0204
OU9-SB-14-0810	OU9-SB-24-0204
OU9-SB-15-0406	OU9-SB-25-0205
OU9-SB-15-0608	OU9-SB-25-0508

Definitions:
ARAR/TBC = Applicable or Relevant and Appropriate Requirements To Be Considered
C = Carcinogen
COPC = Chemical Of Potential Concern
J = Estimated value
N = Noncarcinogen
NA = Not Applicable/Not Available

Rationale Codes:
For selection as a COPC:
ASL = Above Screening Level and site background.

For elimination as a COPC:
BKG = Less than Background Concentration
BSL = Below COPC Screening Level

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

Table No.

Reasonable Maximum/Central Tendency Exposures

3.1 UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY - Surface Soil
3.2 UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY - Subsurface Soil
3.3 EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY - Surface Soil
3.4 EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY - Subsurface Soil
3.5 EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY - Surface Soil
3.6 EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY - Subsurface Soil

TABLE 3.1.RME
UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Benzo(a)anthracene	mg/kg	0.73	2.0 (NP)	7.5 (J)	2.0	mg/kg	95% KM (Chebyshev) UCL	(1)
	Benzo(a)pyrene	mg/kg	0.65	3.3 (L)	7.4 (J)	3.3	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(k)fluoranthene	mg/kg	0.49	2.5 (L)	4.8 (J)	2.5	mg/kg	99% KM (Chebyshev) UCL	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.11	0.31 (NP)	1.6 (J)	0.3	mg/kg	95% KM (Chebyshev) UCL	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	0.31	1.5 (L)	3.5 (J)	1.5	mg/kg	99% KM (Chebyshev) UCL	(1)

L = Lognormal
NP = Non-parametric

(1) ProUCL Version 4.1.00 recommended value.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2.RME
UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
OU9	Mercury	mg/kg	0.68	2.0 (G)	8.2	2.0	mg/kg	95% KM (Chebyshev) UCL	(1)
	2-Methylnaphthalene	mg/kg	32	93 (G)	560 (J)	93	mg/kg	95% KM (t) UCL	(1)
	Acenaphthylene	mg/kg	13	110 (NP)	370	110	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(a)anthracene	mg/kg	18	130 (L)	410 (J)	130	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(a)pyrene	mg/kg	19	140 (L)	450	140	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(b)fluoranthene	mg/kg	16	110 (NP)	360	110	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(g,h,i)perylene	mg/kg	11	76 (NP)	230	76	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(k)fluoranthene	mg/kg	6.4	44 (L)	130 (J)	44	mg/kg	99% KM (Chebyshev) UCL	(1)
	Chrysene	mg/kg	72	130 (NP)	420	130	mg/kg	99% KM (Chebyshev) UCL	(1)
	Dibenzo(a,h)anthracene	mg/kg	3.4	23 (NP)	66	23	mg/kg	99% KM (Chebyshev) UCL	(1)
	Fluoranthene	mg/kg	24	180 (NP)	550	180	mg/kg	99% KM (Chebyshev) UCL	(1)
	Fluorene	mg/kg	11	97 (L)	320	97	mg/kg	99% KM (Chebyshev) UCL	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	7.5	53 (L)	160	53	mg/kg	99% KM (Chebyshev) UCL	(1)
	Naphthalene	mg/kg	19	190 (NP)	640	190	mg/kg	99% KM (Chebyshev) UCL	(1)
	Phenanthrene	mg/kg	48	400 (NP)	1300	400	mg/kg	99% KM (Chebyshev) UCL	(1)
	Pyrene	mg/kg	39	290 (NP)	910 (J)	290	mg/kg	99% KM (Chebyshev) UCL	(1)

G = Gamma
L = Lognormal
NP = Non-parametric

(1) ProUCL Version 4.1.00 recommended value.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.3.RME
EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Benzo(a)anthracene	mg/kg	0.92	1.1 (N)	7.5 (J)	1.1	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	0.81	0.95 (N)	7.4 (J)	0.95	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	0.62	0.72 (N)	4.8 (J)	0.72	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.13	0.16 (N)	1.6 (J)	0.16	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	0.38	0.44 (N)	3.5 (J)	0.44	mg/kg	T-statistic	(1)

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

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.4.RME
EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Mercury	mg/kg	0.73	0.82 (N)	8.2	0.82	mg/kg	T-statistic	(2)
	2-Methylnaphthalene	mg/kg	NA	NA	560 (J)	32	mg/kg	Excavated Area Mean	(1)
	Acenaphthylene	mg/kg	14	17 (N)	370	17	mg/kg	T-statistic	(2)
	Benzo(a)anthracene	mg/kg	20	23 (N)	410 (J)	23	mg/kg	T-statistic	(2)
	Benzo(a)pyrene	mg/kg	21	25 (N)	450	25	mg/kg	T-statistic	(2)
	Benzo(b)fluoranthene	mg/kg	17	20 (N)	360	20	mg/kg	T-statistic	(2)
	Benzo(g,h,i)perylene	mg/kg	12	14 (N)	230	14	mg/kg	T-statistic	(2)
	Benzo(k)fluoranthene	mg/kg	7.1	8.2 (N)	130 (J)	8.2	mg/kg	T-statistic	(2)
	Chrysene	mg/kg	20	23 (N)	420	23	mg/kg	T-statistic	(2)
	Dibenzo(a,h)anthracene	mg/kg	3.7	4.3 (N)	66	4.3	mg/kg	T-statistic	(2)
	Fluoranthene	mg/kg	27	31 (N)	550	31	mg/kg	T-statistic	(2)
	Fluorene	mg/kg	13	15 (N)	320	15	mg/kg	T-statistic	(2)
	Indeno(1,2,3-cd)pyrene	mg/kg	8.2	9.6 (N)	160	9.6	mg/kg	T-statistic	(2)
	Naphthalene	mg/kg	21	26 (N)	640	26	mg/kg	T-statistic	(2)
	Phenanthrene	mg/kg	53	64 (N)	1300	64	mg/kg	T-statistic	(2)
	Pyrene	mg/kg	43	51 (N)	910 (J)	51	mg/kg	T-statistic	(2)

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

1 2-methylnapthalene data was not collected from the unexcavated area so a weighted UCL could not be calculated for that compound. The mean concentration was used as the EPC.
2 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.5.RME
EPCs WEIGHTED 95 PERCENT FOR SOILS WITH NO ASH/BURNT MATERIAL AND 5 PERCENT FOR SOILS WITH ASH/BURNT MATERIAL EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Benzo(a)anthracene	mg/kg	0.77	0.89 (N)	7.5 (J)	0.89	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	0.68	0.79 (N)	7.4 (J)	0.79	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	0.51	0.60 (N)	4.8 (J)	0.60	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.11	0.13 (N)	1.6 (J)	0.13	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	0.32	0.37 (N)	3.5 (J)	0.37	mg/kg	T-statistic	(1)

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

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.6.RME
EPCs WEIGHTED 95 PERCENT FOR SOILS WITH NO ASH/BURNT MATERIAL AND 5 PERCENT FOR SOILS WITH ASH/BURNT MATERIAL EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Mercury	mg/kg	0.23	0.25 (N)	8.2	0.25	mg/kg	T-statistic	(1)
	2-Methylnaphthalene	mg/kg	14	17 (N)	560 (J)	17	mg/kg	T-statistic	(1)
	Acenaphthylene	mg/kg	2.7	3.3 (N)	370	3.3	mg/kg	T-statistic	(1)
	Benzo(a)anthracene	mg/kg	4.0	4.7 (N)	410 (J)	4.7	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	4.3	5.0 (N)	450	5.0	mg/kg	T-statistic	(1)
	Benzo(b)fluoranthene	mg/kg	3.5	4.1 (N)	360	4.1	mg/kg	T-statistic	(1)
	Benzo(g,h,i)perylene	mg/kg	2.5	2.9 (N)	230	2.9	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	1.5	1.7 (N)	130 (J)	1.7	mg/kg	T-statistic	(1)
	Chrysene	mg/kg	4.0	4.6 (N)	420	4.6	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.77	0.87 (N)	66	0.87	mg/kg	T-statistic	(1)
	Fluoranthene	mg/kg	5.5	6.4 (N)	550	6.4	mg/kg	T-statistic	(1)
	Fluorene	mg/kg	2.5	2.9 (N)	320	2.9	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	1.7	2.0 (N)	160	2.0	mg/kg	T-statistic	(1)
	Naphthalene	mg/kg	4.0	5.0 (N)	640	5.0	mg/kg	T-statistic	(1)
	Phenanthrene	mg/kg	10	12 (N)	1300	12	mg/kg	T-statistic	(1)
	Pyrene	mg/kg	8.5	9.9 (N)	910 (J)	9.9	mg/kg	T-statistic	(1)

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

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

LIST OF TABLES
RAGS PART D TABLE 4
VALUES USED FOR DAILY INTAKE CALCULATIONS

Table No.	
	Reasonable Maximum Exposures
4.1.RME	Construction Workers Exposed to Surface/Subsurface Soil
4.2.RME	Construction Workers Exposed to Surface/Subsurface Soil - Soils to Air
4.3.RME	Occupational Workers Exposed to Surface/Subsurface Soil
4.4.RME	Occupational Workers Exposed to Surface/Subsurface Soil - Soils to Air
4.5.RME	Child Recreational Users Exposed to Surface/Subsurface Soil
4.6.RME	Child Recreational Users Exposed to Surface/Subsurface Soil - Soils to Air
4.7.RME	Adult Recreational Users Exposed to Surface/Subsurface Soil
4.8.RME	Adult Recreational Users Exposed to Surface/Subsurface Soil - Soils to Air
4.9.RME	Child Residents Exposed to Surface/Subsurface Soil
4.10.RME	Child Residents Exposed to Surface/Subsurface Soil - Soils to Air
4.11.RME	Adult Residents Exposed to Surface/Subsurface Soil
4.12.RME	Adult Residents Exposed to Surface/Subsurface Soil - Soils to Air
	Central Tendency Exposures
4.1.CTE	Construction Workers Exposed to Surface/Subsurface Soil
4.2.CTE	Construction Workers Exposed to Surface/Subsurface Soil - Soils to Air
4.3.CTE	Occupational Workers Exposed to Surface/Subsurface Soil
4.4.CTE	Occupational Workers Exposed to Surface/Subsurface Soil - Soils to Air
4.5.CTE	Child Recreational Users Exposed to Surface/Subsurface Soil
4.6.CTE	Child Recreational Users Exposed to Surface/Subsurface Soil - Soils to Air
4.7.CTE	Adult Recreational Users Exposed to Surface/Subsurface Soil
4.8.CTE	Adult Recreational Users Exposed to Surface/Subsurface Soil - Soils to Air
4.9.CTE	Child Residents Exposed to Surface/Subsurface Soil
4.10.CTE	Child Residents Exposed to Surface/Subsurface Soil - Soils to Air
4.11.CTE	Adult Residents Exposed to Surface/Subsurface Soil
4.12.CTE	Adult Residents Exposed to Surface/Subsurface Soil - Soils to Air

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CONSTRUCTION WORKERS- SOILS

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				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	OU9	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	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				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	

Notes:

1 - Professional judgment.

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 = 2.77E-08 Cancer Dermal Intake = 8.30E-08

Noncancer Ingestion Intake = 1.94E-06 Noncancer Dermal Intake = 5.81E-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

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	150	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				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	

Notes:

1 - Professional judgment.

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 = 1.96E-03 Noncancer Inhalation Intake = 1.37E-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 - INDUSTRIAL WORKERS - SOIL

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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, 1997	
				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	OU9	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, 1997	
				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, 1997: Exposure Factors Handbook. USEPA/600/8-95/002FA.

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 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - INDUSTRIAL WORKERS - SOIL TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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)	CA x ET x EF x ED
				EF	Exposure Frequency	250	days/year	USEPA, 1997	AT x 24 hours/day
				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	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

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 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	100	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(3)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(3)	
				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	OU9	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	100	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(3)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(3)	
				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 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Professional judgement.

3 - 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) = 1.57E-07 Cancer Dermal Intake (Age 0 - 6) = 8.77E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.83E-06 Noncancer Dermal Intake = 1.02E-05

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 5.22E-08 Cancer Dermal Intake (Age 0 - 2) = 2.92E-07

Cancer Ingestion Intake (Age 2 - 6) = 1.04E-07 Cancer Dermal Intake (Age 2 - 6) = 5.84E-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 4.6.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RECREATIONAL USERS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	100	days/year	(2)	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	CA = (1/PEF + 1/VF) x Cs
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(3)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(3)	
				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	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2010	

Notes:

1 - Professional judgment.

2 - Professional judgement.

3 - 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, 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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

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) = 3.91E-03 Noncancer Inhalation Intake = 4.57E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 1.30E-03

Cancer Inhalation Intake (Age 2 - 6) = 2.61E-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 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	52	days/year	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), 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	OU9	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	(2)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), 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 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for RME and one day a week for CTE.

3 - 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) = 3.49E-08 Cancer Dermal Intake (Age 6 - 30) = 2.78E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.45E-08 Cancer Dermal Intake (Age 6 - 16) = 1.16E-07

Cancer Ingestion Intake Age 16 - 30) = 2.04E-08 Cancer Dermal Intake (Age 16 - 30) = 1.62E-07

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 1.02E-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 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RECREATIONAL USERS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2010	

Notes:

1 - Professional judgement. Assume two days a week in warm weather months for RME and one day a week for CTE.

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

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

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 2.37E-02

Mutagenic Chemicals

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

Cancer Inhalation Intake (Age 16 - 30) = 4.75E-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 - CHILD RESIDENTS - SOILS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	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, 2002b	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(1)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(1)	
				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	OU9	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, 2002b	
				ED1	Exposure Duration (Age 0 - 2)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(1), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(1)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(1)	
				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, 1994: USEPA Region I Risk Updates, August 1994.

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)

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 4.10.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - CHILD RESIDENTS SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	CA x ET x EF x ED / AT x 24 hours/day
				EF	Exposure Frequency	350	days/year	USEPA, 1994	
				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
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(1)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(1)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	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, 1994: USEPA Region I Risk Updates, August 1994.

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

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 4.11.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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, 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, 2002b	
				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	OU9	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, 2002b	
				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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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, 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)

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 4.12.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE - ADULT RESIDENTS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	CA x ET x EF x ED / AT x 24 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	9.37E+09	m3/kg	USEPA, 2010	$PEF = \frac{Q / C \times 3600}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	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	0.0391	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, 1994: USEPA Region I Risk Updates, August 1994.

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

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

Mutagenic Chemicals

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

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

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 9.59E-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 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002a	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	165	mg/day	(1)	
				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	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				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	OU9	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, 2002b	CS x CF3 x SA x SSAF x DABS x EV x EF x ED
				SSAF	Soil to Skin Adherence Factor	0.1	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	75	days/year	(1)	
				ED	Exposure Duration	1	years	(1)	
				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	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

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 = 6.92E-09 Cancer Dermal Intake = 1.38E-08

Noncancer Ingestion Intake = 4.84E-07 Noncancer Dermal Intake = 9.69E-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 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CONSTRUCTION WORKERS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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)	CA x ET x EF x ED
				EF	Exposure Frequency	75	days/year	(1)	AT x 24 hours/day
				ED	Exposure Duration	1	years	(1)	
				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	1.62E+06	m3/kg	USEPA, 2002a	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	

Notes:

1 - Professional judgment. For some factors, CTE is assumed to be 50 percent of RME.

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 = 9.78E-04 Noncancer Inhalation Intake = 6.85E-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 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				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, 1993	BW x AT
				EF	Exposure Frequency	219	days/year	USEPA, 1997	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
Dermal	Industrial Workers	Adult	OU9	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	0.02	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	219	days/year	USEPA, 1997	
				ED	Exposure Duration	9	years	USEPA, 1993	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	

Sources:

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

USEPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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, 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)

Cancer Ingestion Intake = 5.51E-08 Cancer Dermal Intake = 7.27E-08

Noncancer Ingestion Intake = 4.29E-07 Noncancer Dermal Intake = 5.66E-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 4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - INDUSTRIAL WORKERS - SOIL TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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)	CA x ET x EF x ED
				EF	Exposure Frequency	219	days/year	USEPA, 1997	AT x 24 hours/day
				ED	Exposure Duration	9	years	USEPA, 1993	
				AT-C	Averaging Time (Cancer)	25550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	3285	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

Unit Intake Calculations

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

Cancer Inhalation Intake = 2.57E-02 Noncancer Inhalation Intake = 2.00E-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 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	CSs x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	50	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	USEPA, 1989	
				ED2	Exposure Duration (Age 2 - 6)	4	years	USEPA, 1989	
				ADAF1	Age Dependant Adjustment Factor (Ag	10	unitless	(3)	
				ADAF2	Age Dependant Adjustment Factor (Ag	3	unitless	(3)	
				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	OU9	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	0.04	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	50	days/year	(2)	
				ED1	Exposure Duration (Age 0 - 2)	2	years	USEPA, 1989	
				ED2	Exposure Duration (Age 2 - 6)	4	years	USEPA, 1989	
				ADAF1	Age Dependant Adjustment Factor (Ag	10	unitless	(3)	
				ADAF2	Age Dependant Adjustment Factor (Ag	3	unitless	(3)	
				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 - The child recreational user is assumed to be at the site only a portion of the day.

2 - Professional judgement.

3 - 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, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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 = 3.91E-08 Cancer Dermal Intake = 8.77E-09

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 1.30E-08 Cancer Dermal Intake (Age 0 - 2) = 2.92E-08

Cancer Ingestion Intake (Age 2 - 6) = 2.61E-08 Cancer Dermal Intake (Age 2 - 6) = 5.84E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.57E-07 Noncancer Dermal Intake = 1.02E-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.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RECREATIONAL USERS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	2	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	50	days/year	(2)	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	2	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	4	years	(3), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(3)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(3)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2010	

Notes:

1 - Professional judgment.

2 - Professional judgement.

3 - 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, 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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

Unit Intake Calculations

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

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 9.78E-04 Noncancer Inhalation Intake = 1.14E-02

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 3.26E-04

Cancer Inhalation Intake (Age 2 - 6) = 6.52E-04

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.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				CF3	Conversion Factor 3	1.0E-06	kg/mg	--	CS x IRS x CF3 x FI x EF x ED
				FI	Fraction Ingested	0.5	unitless	(1)	BW x AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), 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	OU9	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	0.01	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	26	days/year	(1)	
				ED1	Exposure Duration (Age 6 - 16)	10	years	(3), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	14	years	(3), 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 - The adult recreational user is assumed to be at the site only a portion of the day.

2 - Assume two days a week in warm weather months for RME and one day a week for CTE.

3 - 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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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 = 8.72E-09 Cancer Dermal Intake = 1.99E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 3.63E-09 Cancer Dermal Intake (Age 6 - 16) = 8.29E-09

Cancer Ingestion Intake Age 16 - 30) = 5.09E-09 Cancer Dermal Intake (Age 16 - 30) = 1.16E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 2.54E-08 Noncancer Dermal Intake = 5.80E-08

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.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RECREATIONAL USERS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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	2	hours/day	(1)	CA x ET x EF x ED
				EF	Exposure Frequency	26	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	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	unitless	USEPA, 2010	

Notes:

1 - Professional judgement. Assume two days a week in warm weather months for RME and one day a week for CTE.

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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

Unit Intake Calculations

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

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 2.04E-03

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 5.94E-03

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 8.48E-04

Cancer Inhalation Intake (Age 16 - 30) = 1.19E-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.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS
OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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, 1993	
				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, 1993	BW x AT
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(1)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(1)	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
Dermal	Resident	Child	OU9	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	0.04	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	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(1)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(1)	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	730	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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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

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 = 1.22E-07 Cancer Dermal Intake = 1.37E-07

Mutagenic Chemicals

Cancer Ingestion Intake (Age 0 - 2) = 6.11E-08 Cancer Dermal Intake (Age 0 - 2) = 6.84E-08

Cancer Ingestion Intake (Age 2 - 6) = 6.11E-08 Cancer Dermal Intake (Age 2 - 6) = 6.84E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.27E-06 Noncancer Dermal Intake = 4.79E-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 4.10.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - CHILD RESIDENTS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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, 1993	CA x ET x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1994	AT x 24 hours/day
				ED1	Exposure Duration (Age 0 - 2)	1	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 2 - 6)	1	years	(1), USEPA, 1989, 2005	
				ADAF1	Age Dependant Adjustment Factor (Age 0-2)	10	unitless	(1)	
				ADAF2	Age Dependant Adjustment Factor (Age 2-6)	3	unitless	(1)	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	730	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.37E+09	m3/kg	USEPA, 2010	
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	m/sec	USEPA, 2010	
				V	Fraction of vegetative cover	0.5	unitless	USEPA, 2010	
				F(x)	Function dependent of Um/Ut	0.0391	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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

Unit Intake Calculations

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

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 1.83E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 0 - 2) = 9.16E-03

Cancer Inhalation Intake (Age 2 - 6) = 9.16E-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 4.11.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	CS	Chemical concentration in soil	Max or 95% UCL	mg/kg	USEPA, 2002	Intake (mg/kg/day) =
				IR-S	Ingestion Rate	50	mg/day	USEPA, 1993	
				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, 1993	BW x AT
				EF	Exposure Frequency	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	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)	2,555	days	USEPA, 1989	
Dermal	Resident	Adult	OU9	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	0.01	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	234	days/year	USEPA, 1993	
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	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)	2,555	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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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.

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 = 4.58E-08 Cancer Dermal Intake = 5.22E-08

Mutagenic Chemicals

Cancer Ingestion Intake (Age 6 - 16) = 1.31E-08 Cancer Dermal Intake (Age 6 - 16) = 1.49E-08

Cancer Ingestion Intake (Age 16 - 30) = 3.27E-08 Cancer Dermal Intake (Age 16 - 30) = 3.73E-08

Noncarcinogenic Chemicals

Noncancer Ingestion Intake = 4.58E-07 Noncancer Dermal Intake = 5.22E-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 4.12.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURES - ADULT RESIDENTS - SOILS TO AIR

OPERABLE UNIT 9 REMEDIAL INVESTIGATION, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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	OU9	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, 1993	CA x ET x EF x ED
				EF	Exposure Frequency	234	days/year	USEPA, 1994	AT x 24 hours/day
				ED1	Exposure Duration (Age 6 - 16)	2	years	(1), USEPA, 1989, 2005	
				ED2	Exposure Duration (Age 16 - 30)	5	years	(1), USEPA, 1989, 2005	
				AT-C	Averaging Time (Cancer)	25,550	days	USEPA, 1989	CA = (1/PEF + 1/VF) x Cs
				AT-N	Averaging Time (Non-Cancer)	2555	days	USEPA, 1989	
				PEF	Particulate Emission Factor	9.37E+09	m3/kg	USEPA, 2010	$PEF = \frac{Q / C \times 3600}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$
				VF	Volatilization Factor	Chemical-specific	m3/kg	USEPA, 2002a	
				Q/C	Inverse of mean concentration at center of source	74.3185	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	3.89	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	0.0391	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, 1993: Superfund Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

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

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://rais.ornl.gov/cgi-bin/epa/ssl1.shtml. Site-specific values for Portland, Maine. Accessed December 2010.

Unit Intake Calculations

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

Non-Mutagenic Chemicals

Cancer Inhalation Intake = 6.41E-02

Noncarcinogenic Chemicals

Noncancer Inhalation Intake = 6.41E-01

Mutagenic Chemicals

Cancer Inhalation Intake (Age 6 - 16) = 1.83E-02

Cancer Inhalation Intake (Age 16 - 30) = 4.58E-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

LIST OF TABLES
RAGS PART D TABLE 5
NON-CANCER TOXICITY DATA

Table No.

5-1 Non-Cancer Toxicity Data - Oral/Dermal
5-2 Non-Cancer Toxicity Data - Inhalation

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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)
PAHs										
2-Methylnaphthalene	Chronic	4.0E-03	mg/kg/day	1	4.0E-03	mg/kg/day	Lungs	1000/1	IRIS	12/10/2010
Acenaphthene	Chronic	6.0E-02	0.06	1	6.0E-02	mg/kg/day	Blood	3000/1	IRIS	2/15/2011
Acenaphthylene[3]	Chronic	6.0E-02	0.06	1	6.0E-02	mg/kg/day	Blood	3000/1	IRIS	2/15/2011
Benzo(a)anthracene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Benzo(g,h,I)perylene[4]	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Liver	3000/1	IRIS	2/15/2011
Benzo(k)fluoranthene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Fluoranthene	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	Liver	3000/1	IRIS	2/15/2011
Fluorene	Chronic	4.0E-02	mg/kg/day	1	4.0E-02	mg/kg/day	Blood	3000/1	IRIS	2/15/2011
Indeno(1,2,3-cd)pyrene	NA	NA	NA	1	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	2.0E-02	mg/kg/day	1	2.0E-02	mg/kg/day	Body Weight	3000/1	IRIS	12/10/2010
Phenanthrene[4]	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	2/15/2011
Pyrene	Chronic	3.0E-02	mg/kg/day	1	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	2/15/2011
Inorganics										
Antimony	Chronic	4.0E-04	mg/kg/day	0.15	6.0E-05	mg/kg/day	Blood	1000/1	IRIS	9/09/2009
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[5]	Chronic	3.0E-04	mg/kg/day	0.07	2.1E-05	mg/kg/day	Autoimmune	1000/1	IRIS	9/09/2009

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 - Acenaphthene used as surrogate.
4 - Pyrene used as surrogate.
5 - Values are for mercury inorganic salts.

Definitions:
IRIS = Integrated Risk Information System
NA = Not Available.

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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)
PAHs									
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.0E-03	mg/m3	8.6E-04	mg/m3	Nasal	3000/1	IRIS	2/15/2011
Phenanthrene									
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics									
Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury[2]	Chronic	3.00E-05	mg/m3	8.6E-06	mg/m3	CNS	NA	Cal EPA	09/2009

Notes:
1 - Extrapolated RfD = RfC *20m^3/day / 70 kg
2 - Values are for mercuric chloride and other inorganic salts.

Definitions:
Cal EPA = California Environmental Protection Agency
CNS = Central Nervous System
IRIS = Integrated Risk Information System
NA = Not Applicable

LIST OF TABLES
RAGS PART D TABLE 6
CANCER TOXICITY DATA

Table No.

6-1 Cancer Toxicity Data - Oral/Dermal
6-2 Cancer Toxicity Data - Inhalation

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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)
PAHs								
2-Methylnaphthalene	NA	NA	1	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	1	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	1	NA	NA	NA	NA	NA
Benzo(a)anthracene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(a)pyrene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	IRIS	12/10/2010
Benzo(b)fluoranthene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Benzo(g,h,i)perylene	NA	NA	1	NA	NA	NA	NA	NA
Benzo(k)fluoranthene[3]	7.3E-02	$(mg/kg/day)^{-1}$	1	7.3E-02	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Chrysene[3]	7.3E-03	$(mg/kg/day)^{-1}$	1	7.3E-03	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Dibenzo(a,h)anthracene[3]	7.3E+00	$(mg/kg/day)^{-1}$	1	7.3E+00	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Fluoranthene	NA	NA	1	NA	NA	NA	NA	NA
Fluorene	NA	NA	1	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene[3]	7.3E-01	$(mg/kg/day)^{-1}$	1	7.3E-01	$(mg/kg/day)^{-1}$	B2 / Probable human carcinogen	USEPA(1)	7/1993
Naphthalene	NA	NA	1	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	1	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics								
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	9/09/2009
Mercury	NA	NA	NA	NA	NA	C/ Possible Human Carcinogen	IRIS	9/09/2009

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.

3 - The carcinogenic PAHs are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Definitions:

USEPA(1) = United States Environmental Protection Agency. EPA/600/R 93 089.

IRIS = Integrated Risk Information System.

NA = Not Available.

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
OPERABLE UNIT 9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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)
PAHs							
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(a)pyrene[2]	1.1E-03	$(ug/m^3)^{-1}$	3.9E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(b)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Benzo(g,h,i)perylene			0.0E+00				
Benzo(k)fluoranthene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Chrysene[2]	1.1E-05	$(ug/m^3)^{-1}$	3.9E-02	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Dibenzo(a,h)anthracene[2]	1.2E-03	$(ug/m^3)^{-1}$	4.2E+00	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Fluoranthene	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene[2]	1.1E-04	$(ug/m^3)^{-1}$	3.9E-01	$(mg/kg/day)^{-1}$	NA	Cal EPA	9/2009
Naphthalene	3.4E-05	$(ug/m^3)^{-1}$	1.2E-01	$(mg/kg/day)^{-1}$	C/ Possible Human Carcinogen	Cal EPA	8/2004
Phenanthrene	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA
Inorganics							
Antimony	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	B2 / Probable human carcinogen	IRIS	9/09/2009
Mercury	NA	NA	NA	NA	C/ Possible Human Carcinogen	IRIS	9/09/2009

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

2 - The carcinogenic PAHs are considered to act via the mutagenic mode of action. These chemicals are evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Cal EPA = California Environmental Protection Agency.

IRIS = Integrated Risk Information System.

NA = Not Available.

RAGS TABLES 7 and 9

EPCS unweighted from ProUCL

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.RME	Occupational Workers - Entire Site Surface Soil
7.3.RME	Child Recreational Users - Entire Site Surface Soil
7.4.RME	Adult Recreational Users - Entire Site Surface Soil
7.5.RME	Child Residents - Entire Site Surface Soil
7.6.RME	Adult Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
7.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.CTE	Occupational Workers - Entire Site Surface Soil
7.3.CTE	Child Recreational Users - Entire Site Surface Soil
7.4.CTE	Adult Recreational Users - Entire Site Surface Soil
7.5.CTE	Child Residents - Entire Site Surface Soil
7.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	5.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-08	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	9.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-07	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	6.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-09	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	8.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-08	5.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	4.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.0E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-07	2.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-09	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.1E-07					--
		Exposure Point Total									1.1E-06					--
	Exposure Medium Total										1.1E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	4.2E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.6E-14	2.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	6.9E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.6E-13	4.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	5.2E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-14	3.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	6.3E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.5E-14	4.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	3.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.4E-14	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-13					--
		Exposure Point Total									9.7E-13					--
	Exposure Medium Total										9.7E-13					--
Medium Total											1.1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	5.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	93.0	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.05
				Acenaphthylene	110	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.004
				Benzo(a)anthracene	130	mg/kg	3.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-06	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	3.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-05	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-06	2.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
				Benzo(k)fluoranthene	44.0	mg/kg	1.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.9E-08	8.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	3.6E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	6.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-06	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	5.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.009
				Fluorene	97.0	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.005
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-06	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	5.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				Phenanthrene	400	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.03
				Pyrene	290	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
			Exp. Route Total								3.9E-05					0.1

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	7.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-07	8.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	4.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-08	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	5.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-07	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.007
				Phenanthrene	400	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.007
			Exp. Route Total								1.5E-05					0.05
		Exposure Point Total									5.4E-05					0.2
	Exposure Medium Total										5.4E-05					0.2
	Air	OU9	Inhalation	Mercury	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	3.5E-05	(mg/m^3)	0.005
				2-Methylnaphthalene	6.8E-05	mg/m^3	1.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	4.2E-3	mg/m^3	8.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	9.1E-5	mg/m^3	1.8E-07	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.0E-08	1.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	9.8E-5	mg/m^3	1.9E-07	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-07	1.3E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	7.7E-5	mg/m^3	1.5E-07	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-08	1.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	5.3E-5	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	3.1E-5	mg/m^3	6.0E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-09	4.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	9.1E-5	mg/m^3	1.8E-07	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.0E-09	1.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.8E-08	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.3E-4	mg/m^3	2.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	1.5E-3	mg/m^3	3.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.7E-5	mg/m^3	7.3E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.0E-09	5.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	1.8E-02	mg/m^3	3.6E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.2E-06	2.5E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.8
				Phenanthrene	2.1E-3	mg/m^3	4.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	2.0E-4	mg/m^3	4.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-05	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-06					0.8
		Exposure Point Total									1.5E-06					0.8
	Exposure Medium Total										1.5E-06					0.8
Medium Total											5.6E-05					1.0
										Total of Receptor Risks Across All Media	5.7E-05				Total of Receptor Hazards Across All Media	1.0

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	7.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-06	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	8.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.4E-08	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	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)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	5.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	6.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	9.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.2E-06	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	7.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.5E-08	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	9.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-07	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	4.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.7E-06					--
		Exposure Point Total									1.9E-05					--
	Exposure Medium Total										1.9E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	2.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.2E-11	8.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	2.6E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.1E-12	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	3.7E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.0E-11					--
		Exposure Point Total									4.0E-11					--
	Exposure Medium Total										4.0E-11					--
Medium Total											1.9E-05					--
										Total of Receptor Risks Across All Media	1.9E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-05	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-07	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.1E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.4E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	9.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-05					--
		Exposure Point Total									4.2E-05					--
	Exposure Medium Total										4.2E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	4.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.9E-13	9.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	7.4E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.1E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	5.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-13	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	6.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.0E-13	1.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	3.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-13	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-11					--
		Exposure Point Total									1.0E-11					--
	Exposure Medium Total										1.0E-11					--
Medium Total											4.2E-05					--
										Total of Receptor Risks Across All Media	4.2E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3	mg/kg	2.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5	mg/kg	1.6E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.3	mg/kg	1.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-07	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5	mg/kg	9.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					--
			Dermal	Benzo(a)anthracene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-06	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5	mg/kg	1.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.3	mg/kg	2.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.3E-08	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					--
		Exposure Point Total									3.8E-06					--
	Exposure Medium Total										3.8E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	3.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-13	5.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	5.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.8E-12	8.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	4.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-13	6.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	4.8E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.7E-13	7.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	2.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-13	3.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.4E-12					--
		Exposure Point Total									7.4E-12					--
	Exposure Medium Total										7.4E-12					--
Medium Total											3.8E-06					--
										Total of Receptor Risks Across All Media	3.8E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-06	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-06	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-05	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	8.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-04					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	4.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-06	9.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	7.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-05	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	5.3E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	6.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.7E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	3.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-06	7.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.2E-05					--
		Exposure Point Total									2.3E-04					--
	Exposure Medium Total										2.3E-04					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	9.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-10	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.4E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	7.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-12	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-10					--
		Exposure Point Total									2.2E-10					--
	Exposure Medium Total										2.2E-10					--
Medium Total											2.3E-04					--
										Total of Receptor Risks Across All Media	2.3E-04				Total of Receptor Hazards Across All Media	--

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-05	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.6E-07	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-06	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.5E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	8.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.5E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.2E-08	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-07	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	6.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					--
		Exposure Point Total									3.8E-05					--
	Exposure Medium Total										3.8E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.3E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	2.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-10	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.9E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.3E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	9.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.0E-10					--
		Exposure Point Total									3.0E-10					--
	Exposure Medium Total										3.0E-10					--
Medium Total											3.8E-05					--
										Total of Receptor Risks Across All Media	3.8E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-09	7.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	3.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	5.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.3E-08	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	4.5E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.3E-10	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	5.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-09	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	2.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.2E-08					--
		Exposure Point Total									2.5E-07					--
	Exposure Medium Total										2.5E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	9.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.3E-6	mg/m^3	2.3E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.5E-09	1.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.7E-6	mg/m^3	1.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-10	1.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.1E-7	mg/m^3	2.1E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.5E-10	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-6	mg/m^3	1.0E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	7.2E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.2E-09					--
		Exposure Point Total									3.2E-09					--
	Exposure Medium Total										3.2E-09					--
Medium Total											2.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	1.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	6.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	7.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0009
				Benzo(a)anthracene	130	mg/kg	9.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.6E-07	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-06	6.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-07	5.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	5.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	3.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.2E-08	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	9.0E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.6E-09	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.005
				Phenanthrene	400	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
			Exp. Route Total								9.7E-06					0.04

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44.0	mg/kg	7.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.8E-09	5.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.3E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.7E-09	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-07	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	97.0	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	9.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-08	6.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	290	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.5E-06					0.008
		Exposure Point Total									1.2E-05					0.04
	Exposure Medium Total										1.2E-05					0.04
	Air	OU9	Inhalation	Mercury	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.6E-08	(mg/m^3)	3.5E-05	(mg/m^3)	0.003
				2-Methylnaphthalene	7.2E-03	mg/m^3	7.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	4.2E-3	mg/m^3	4.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	9.1E-5	mg/m^3	8.9E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.8E-09	6.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	9.8E-5	mg/m^3	9.6E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-07	6.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	7.7E-5	mg/m^3	7.5E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.3E-09	5.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	5.3E-5	mg/m^3	5.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	3.1E-5	mg/m^3	3.0E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-09	2.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	9.1E-5	mg/m^3	8.9E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	9.8E-10	6.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.9E-08	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.3E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	1.5E-3	mg/m^3	1.5E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.7E-5	mg/m^3	3.6E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.0E-09	2.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	1.8E-02	mg/m^3	1.8E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	6.2E-07	1.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.4
				Phenanthrene	2.1E-3	mg/m^3	2.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	2.0E-4	mg/m^3	2.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-05	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.7E-07					0.4
		Exposure Point Total									7.7E-07					0.4
	Exposure Medium Total										7.7E-07					0.4
Medium Total											1.3E-05					0.5
										Total of Receptor Risks Across All Media	1.3E-05				Total of Receptor Hazards Across All Media	0.5

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.0E-08	8.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.4E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	8.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.0E-08	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.4E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.7E-09	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-07					--
		Exposure Point Total									1.9E-06					--
	Exposure Medium Total										1.9E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	5.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.0E-13	4.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	9.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.0E-11	7.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	6.9E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.5E-13	5.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	8.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	9.9E-13	6.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	4.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-13	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-11					--
		Exposure Point Total									1.3E-11					--
	Exposure Medium Total										1.3E-11					--
Medium Total											1.9E-06					--
										Total of Receptor Risks Across All Media	1.9E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	4.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-07	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	5.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	6.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-08	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	9.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-06					--
		Exposure Point Total									7.8E-06					--
	Exposure Medium Total										7.8E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-13	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-12	4.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-13	3.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.0E-13	3.7E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	8.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.2E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.6E-12					--
		Exposure Point Total									2.6E-12					--
	Exposure Medium Total										2.6E-12					--
Medium Total											7.8E-06					--
										Total of Receptor Risks Across All Media	7.8E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	3.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	5.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	8.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	4.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-08	7.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.6E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	9.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.7E-10	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	2.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	7.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-07					--
		Exposure Point Total									6.0E-07					--
	Exposure Medium Total										6.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	8.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.8E-14	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-12	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	1.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-13	1.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	6.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-14	9.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-12					--
		Exposure Point Total									1.9E-12					--
	Exposure Medium Total										1.9E-12					--
Medium Total											6.0E-07					--
										Total of Receptor Risks Across All Media	6.0E-07				Total of Receptor Hazards Across All Media	--

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	8.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.0E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.4E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-07	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-06	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.9E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-08	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-07	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-07	9.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-06					--
		Exposure Point Total									2.6E-05					--
	Exposure Medium Total										2.6E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	4.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.6E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	3.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.8E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.6E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.9E-11					--
		Exposure Point Total									5.9E-11					--
	Exposure Medium Total										5.9E-11					--
Medium Total											2.6E-05					--
										Total of Receptor Risks Across All Media	2.6E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	9.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-08	6.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-07	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.9E-09	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.1E-07					--
		Exposure Point Total									2.4E-06					--
	Exposure Medium Total										2.4E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	3.5E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.9E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.2E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.9E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.0E-11					--
		Exposure Point Total									5.0E-11					--
	Exposure Medium Total										5.0E-11					--
Medium Total											2.4E-06					--
										Total of Receptor Risks Across All Media	2.4E-06				Total of Receptor Hazards Across All Media	--

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface Soil
9.3.RME	Child Recreational Users - Entire Site Surface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface Soil
9.6.RME	Child Residents - Entire Site Surface Soil
9.7.RME	Adult Residents - Entire Site Surface Soil
9.8.RME	Lifetime Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface Soil
9.5.CTE	Child Residents - Entire Site Surface Soil
9.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Benzo(a)pyrene	7E-07	--	3E-07	--	9E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	5E-09	--	2E-09	--	7E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	2E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	8E-07	--	3E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-09	--	--	5E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-10	--	--	5E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Chemical Total	--	6E-09	--	--	6E-09		- -	--	- -	--
		Exposure Point Total						6E-09					--
	Exposure Medium Total							6E-09					--
Medium Total								1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.05	- -	0.01	0.06
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.004	- -	0.001	0.005
			Benzo(a)anthracene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	4E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	9E-07	--	3E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.005	- -	0.002	0.007
			Benzo(k)fluoranthene	9E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	2E-06	--	6E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.009	- -	0.003	0.01
			Fluorene	- -	--	- -	--	- -	Blood	0.005	- -	0.002	0.007
			Indeno(1,2,3-cd)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.02	- -	0.007	0.03
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.03	- -	0.01	0.04
			Pyrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.007	0.03
			Chemical Total	4E-05	--	2E-05	--	5E-05		0.1	--	0.05	0.2
		Exposure Point Total						5E-05					0.2
	Exposure Medium Total							5E-05					0.2

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	0.005	- -	0.005
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-07	--	--	2E-07	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Chrysene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-08	--	--	4E-08	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.8	- -	0.8
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.8	- -	0.8
		Exposure Point Total						2E-06					0.8
	Exposure Medium Total							2E-06					0.8
Medium Total								6E-05					1
Receptor Total							Receptor Risk Total	6E-05				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.01
Total Blood HI	0.01
Total Body Weight HI	0.03
Total Kidney HI	0.06
Total Liver HI	0.02
Total Lungs HI	0.06
Total Nasal HI	0.8

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	8E-06	--	7E-06	--	2E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	6E-08	--	5E-08	--	1E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	7E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	4E-07	--	3E-07	--	7E-07	NA	--	- -	--	--
			Chemical Total	1E-05	--	9E-06	--	2E-05		--	--	--	--
		Exposure Point Total						2E-05					--
	Exposure Medium Total							2E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Chemical Total	--	4E-11	--	--	4E-11		- -	--	- -	--
		Exposure Point Total						4E-11					--
	Exposure Medium Total							4E-11					--
Medium Total								2E-05					--
Receptor Total							Receptor Risk Total	2E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-07	--	1E-07	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	7E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	2E-05	--	2E-05	--	4E-05		--	--	--	--
		Exposure Point Total						4E-05					--
	Exposure Medium Total							4E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								4E-05					--
Receptor Total							Receptor Risk Total	4E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	9E-08	--	1E-07	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	3E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	1E-08	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-08	--	7E-08	--	1E-07	NA	--	- -	--	--
			Chemical Total	2E-06	--	2E-06	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-06					--
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Chemical Total	--	7E-12	--	--	7E-12		- -	--	- -	--
		Exposure Point Total						7E-12					--
	Exposure Medium Total							7E-12					--
Medium Total								4E-06					--
Receptor Total							Receptor Risk Total	4E-06				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	1E-06	--	1E-06	--	2E-06
			Benzo(a)pyrene	2E-05	--	2E-05	--	4E-05
			Benzo(k)fluoranthene	2E-07	--	1E-07	--	3E-07
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06
			Indeno(1,2,3-cd)pyrene	1E-06	--	7E-07	--	2E-06
			Chemical Total	3E-05	--	2E-05	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
	Air	OU9	Benzo(a)anthracene	--	8E-13	--	--	8E-13
			Benzo(a)pyrene	--	1E-11	--	--	1E-11
			Benzo(k)fluoranthene	--	1E-12	--	--	1E-12
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13
			Chemical Total	--	2E-11	--	--	2E-11
		Exposure Point Total						2E-11
	Exposure Medium Total							2E-11
Medium Total								5E-05
Receptor Total							Receptor Risk Total	5E-05

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	9E-06	--	3E-06	--	1E-05	NA	--	- -	--	--
			Benzo(a)pyrene	1E-04	--	5E-05	--	2E-04	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Chemical Total	2E-04	--	6E-05	--	2E-04		--	--	--	--
		Exposure Point Total						2E-04					--
	Exposure Medium Total							2E-04					--
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Chemical Total	--	2E-10	--	--	2E-10		- -	--	- -	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
Medium Total								2E-04					--
Receptor Total							Receptor Risk Total	2E-04				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-07	--	8E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	5E-07	--	1E-06	NA	--	- -	--	--
			Chemical Total	2E-05	--	1E-05	--	4E-05		--	--	--	--
		Exposure Point Total						4E-05					--
	Exposure Medium Total							4E-05					--
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	--	- -	--
		Exposure Point Total						3E-10					--
	Exposure Medium Total							3E-10					--
Medium Total								4E-05					--
Receptor Total							Receptor Risk Total	4E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	1E-05	--	4E-06	--	1E-05
			Benzo(a)pyrene	2E-04	--	6E-05	--	2E-04
			Benzo(k)fluoranthene	1E-06	--	5E-07	--	2E-06
			Dibenzo(a,h)anthracene	1E-05	--	6E-06	--	2E-05
			Indeno(1,2,3-cd)pyrene	7E-06	--	3E-06	--	1E-05
			Chemical Total	2E-04	--	7E-05	--	3E-04
		Exposure Point Total						3E-04
	Exposure Medium Total							3E-04
	Air	OU9	Benzo(a)anthracene	--	2E-11	--	--	2E-11
			Benzo(a)pyrene	--	4E-10	--	--	4E-10
			Benzo(k)fluoranthene	--	3E-11	--	--	3E-11
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11
			Chemical Total	--	5E-10	--	--	5E-10
		Exposure Point Total						5E-10
	Exposure Medium Total							5E-10
Medium Total								3E-04
Receptor Total							Receptor Risk Total	3E-04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	4E-08	--	2E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	3E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	8E-09	--	2E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	5E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Chemical Total	--	3E-09	--	--	3E-09		- -	--	- -	--
		Exposure Point Total						3E-09					--
	Exposure Medium Total							3E-09					--
Medium Total								3E-07					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0009	- -	0.0002	0.001
			Benzo(a)anthracene	7E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	7E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-07	--	1E-07	--	7E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0003	0.002
			Benzo(k)fluoranthene	2E-08	--	6E-09	--	3E-08	NA	--	- -	--	--
			Chrysene	7E-09	--	2E-09	--	8E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	3E-07	--	1E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	3E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.005	- -	0.001	0.006
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.002	0.008
			Pyrene	- -	--	- -	--	- -	Kidney	0.005	- -	0.001	0.006
			Chemical Total	1E-05	--	3E-06	--	1E-05		0.04	--	0.008	0.04
		Exposure Point Total						1E-05					0.04
	Exposure Medium Total							1E-05					0.04

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	0.003	- -	0.003
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-08	--	--	1E-08	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-07	--	--	1E-07	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Chrysene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Naphthalene	--	6E-07	--	--	6E-07	Nasal	- -	0.4	- -	0.4
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	8E-07	--	--	8E-07		- -	0.4	- -	0.4
		Exposure Point Total						8E-07					0.4
	Exposure Medium Total							8E-07					0.4
Medium Total								1E-05					0.5
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	0.5

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.003
Total Body Weight HI	0.006
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.4

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	2E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	2E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-08	--	1E-08	--	7E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	3E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								2E-06					--
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	3E-07	--	9E-08	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	1E-06	--	6E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-07	--	1E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	2E-06	--	8E-06		--	--	--	--
		Exposure Point Total						8E-06					--
	Exposure Medium Total							8E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								8E-06					--
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	1E-07	--	5E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	9E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	5E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	1E-07	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-07					--
	Air	OU9	Benzo(a)anthracene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-14	--	--	7E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								6E-07					--
Receptor Total							Receptor Risk Total	6E-07				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-06	--	2E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	3E-06	--	2E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	1E-07	--	1E-06	NA	--	- -	--	--
			Chemical Total	2E-05	--	3E-06	--	3E-05		--	--	--	--
		Exposure Point Total						3E-05					--
	Exposure Medium Total							3E-05					--
	Air	OU9	Benzo(a)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								3E-05					--
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	2E-09	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	3E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	5E-11	--	--	5E-11		- -	--	- -	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
Medium Total								2E-06					--
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

RAGS TABLES 7 and 9

EPCS Weighted 90% Excavated Area 10% Unexcavated Area

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.RME	Occupational Workers - Entire Site Surface Soil
7.3.RME	Child Recreational Users - Entire Site Surface Soil
7.4.RME	Adult Recreational Users - Entire Site Surface Soil
7.5.RME	Child Residents - Entire Site Surface Soil
7.6.RME	Adult Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
7.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.CTE	Occupational Workers - Entire Site Surface Soil
7.3.CTE	Child Recreational Users - Entire Site Surface Soil
7.4.CTE	Adult Recreational Users - Entire Site Surface Soil
7.5.CTE	Child Residents - Entire Site Surface Soil
7.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	3.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-08	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-07	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-09	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	4.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-08	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-09	8.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.6E-07					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-09	8.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-08	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	7.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.7E-10	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-09	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-07					--
		Exposure Point Total									3.6E-07					--
	Exposure Medium Total										3.6E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	7.7E-7	mg/m^3	1.5E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-10	1.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	6.6E-7	mg/m^3	1.3E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-09	9.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.0E-7	mg/m^3	9.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	6.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.1E-7	mg/m^3	2.2E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.6E-10	1.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.1E-7	mg/m^3	6.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-11	4.2E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-09					--
		Exposure Point Total									2.0E-09					--
	Exposure Medium Total										2.0E-09					--
Medium Total											3.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	0.82	mg/kg	2.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				2-Methylnaphthalene	32.0	mg/kg	8.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	17	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0005
				Benzo(a)anthracene	23	mg/kg	6.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.6E-07	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-06	4.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	5.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-07	3.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	3.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Benzo(k)fluoranthene	8.2	mg/kg	2.3E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.7E-08	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	6.4E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.6E-09	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	1.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.7E-07	8.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	8.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	15.0	mg/kg	4.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.003
				Phenanthrene	64	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
				Pyrene	51	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
			Exp. Route Total								7.0E-06					0.03

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32.0	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.005
				Acenaphthylene	17	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	23	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	2.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
				Benzo(k)fluoranthene	8.2	mg/kg	8.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.5E-09	6.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	2.5E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.8E-09	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	4.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.4E-07	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	15.0	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-08	7.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0010
				Phenanthrene	64	mg/kg	6.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	51	mg/kg	5.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.7E-06					0.010
		Exposure Point Total									9.7E-06					0.04
	Exposure Medium Total										9.7E-06					0.04
	Air	OU9	Inhalation	Mercury	5.7E-7	mg/m^3	1.1E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-03	mg/m^3	4.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	6.4E-4	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.8E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-09	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.7E-5	mg/m^3	3.4E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.8E-08	2.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.4E-5	mg/m^3	2.7E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-09	1.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	9.8E-6	mg/m^3	1.9E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.7E-6	mg/m^3	1.1E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-09	7.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.5E-10	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.0E-6	mg/m^3	5.9E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.1E-09	4.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	2.2E-5	mg/m^3	4.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.5E-4	mg/m^3	4.9E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	6.7E-6	mg/m^3	1.3E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-09	9.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	2.5E-03	mg/m^3	5.0E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.7E-07	3.5E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.1
				Phenanthrene	1.9E-3	mg/m^3	3.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.6E-5	mg/m^3	7.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-07					0.1
		Exposure Point Total									2.2E-07					0.1
	Exposure Medium Total										2.2E-07					0.1
Medium Total											1.0E-05					0.2
										Total of Receptor Risks Across All Media	1.0E-05				Total of Receptor Hazards Across All Media	0.2

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	3.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	3.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-06	9.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.8E-08	7.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	5.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-07	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.2E-06					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	3.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-07	9.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-06	8.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.6E-08	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.6E-08	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.8E-06					--
		Exposure Point Total									6.0E-06					--
	Exposure Medium Total										6.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	9.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-12	2.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	8.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.1E-12	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	6.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.9E-13	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	1.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-12	3.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	3.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-13	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-11					--
		Exposure Point Total									1.3E-11					--
	Exposure Medium Total										1.3E-11					--
Medium Total											6.0E-06					--
										Total of Receptor Risks Across All Media	6.0E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	9.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	7.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	6.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.4E-08	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-07	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	8.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.7E-06					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	6.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.4E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-08	9.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	9.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-07	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.6E-06					--
		Exposure Point Total									1.3E-05					--
	Exposure Medium Total										1.3E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	2.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-13	5.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	2.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-12	4.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	1.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-13	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	3.6E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.3E-13	7.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	9.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-12					--
		Exposure Point Total									3.3E-12					--
	Exposure Medium Total										3.3E-12					--
Medium Total											1.3E-05					--
										Total of Receptor Risks Across All Media	1.3E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	7.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.4E-07	9.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.6E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.4E-09	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-08	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	4.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.9E-07					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	7.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.3E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-07	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-09	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.8E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	4.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.2E-07					--
		Exposure Point Total									1.2E-06					--
	Exposure Medium Total										1.2E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-13	2.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	1.5E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-12	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	1.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-13	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	2.5E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.1E-13	4.1E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	7.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-14	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-12					--
		Exposure Point Total									2.4E-12					--
	Exposure Medium Total										2.4E-12					--
Medium Total											- -					--
										Total of Receptor Risks Across All Media	1.2E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	6.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-06	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-05	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.1E-07	9.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	9.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-06	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-06	5.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.4E-05					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	2.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-06	5.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	3.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-06	7.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	9.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.8E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-05					--
		Exposure Point Total									7.4E-05					--
	Exposure Medium Total										7.4E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	5.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	4.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.9E-11	9.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	3.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-12	7.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	7.5E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	9.0E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	2.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-12	4.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.0E-11					--
		Exposure Point Total									7.0E-11					--
	Exposure Medium Total										7.0E-11					--
Medium Total											7.4E-05					--
										Total of Receptor Risks Across All Media	7.4E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	9.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	8.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.0E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	6.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.5E-08	9.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-06	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-07	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.0E-06					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	4.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-07	7.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	4.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.1E-06	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	3.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.3E-08	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	7.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.1E-06					--
		Exposure Point Total									1.2E-05					--
	Exposure Medium Total										1.2E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	7.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.8E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	6.1E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	6.7E-11	9.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	4.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.1E-12	7.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	1.0E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.2E-11	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	2.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-12	4.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.6E-11					--
		Exposure Point Total									9.6E-11					--
	Exposure Medium Total										9.6E-11					--
Medium Total											1.2E-05					--
										Total of Receptor Risks Across All Media	1.2E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	7.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-09	5.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-08	4.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	5.0E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.6E-10	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.1E-09	7.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-09	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.4E-08					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	2.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-09	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.3E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.5E-11	9.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	2.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-09	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	7.9E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-10	5.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-08					--
		Exposure Point Total									8.1E-08					--
	Exposure Medium Total										8.1E-08					--
	Air	OU9	Inhalation	Benzo(a)anthracene	7.7E-7	mg/m^3	7.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.3E-11	5.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	6.6E-7	mg/m^3	6.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.2E-10	4.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.0E-7	mg/m^3	4.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.4E-11	3.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.1E-7	mg/m^3	1.1E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.3E-10	7.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.1E-7	mg/m^3	3.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-11	2.1E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-09					--
		Exposure Point Total									1.0E-09					--
	Exposure Medium Total										1.0E-09					--
Medium Total											8.2E-08					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	0.82	mg/kg	5.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				2-Methylnaphthalene	32.0	mg/kg	2.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	17	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	23	mg/kg	1.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-07	9.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	9.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	8.2	mg/kg	5.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.1E-09	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.6E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.2E-09	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	3.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	2.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0004
				Fluorene	15.0	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	6.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-08	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	64	mg/kg	4.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	51	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0008
			Exp. Route Total								1.8E-06					0.009

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32.0	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0008
				Acenaphthylene	17	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00004
				Benzo(a)anthracene	23	mg/kg	4.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	4.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	3.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00006
				Benzo(k)fluoranthene	8.2	mg/kg	1.5E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-09	1.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	4.1E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.0E-10	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	7.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.6E-08	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	5.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00010
				Fluorene	15.0	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	4.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	64	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	51	mg/kg	9.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								4.6E-07					0.002
		Exposure Point Total									2.2E-06					0.01
	Exposure Medium Total										2.2E-06					0.01
	Air	OU9	Inhalation	Mercury	5.7E-7	mg/m^3	5.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-03	mg/m^3	2.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	6.4E-4	mg/m^3	6.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-09	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.7E-5	mg/m^3	1.7E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.9E-08	1.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.4E-5	mg/m^3	1.4E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-09	9.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	9.8E-6	mg/m^3	9.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.7E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.7E-6	mg/m^3	5.6E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.2E-10	3.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.7E-10	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.0E-6	mg/m^3	2.9E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-09	2.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	2.2E-5	mg/m^3	2.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.5E-4	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	6.7E-6	mg/m^3	6.6E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.2E-10	4.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	2.5E-03	mg/m^3	2.5E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	8.4E-08	1.7E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.06
				Phenanthrene	1.9E-3	mg/m^3	1.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.6E-5	mg/m^3	3.5E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-07					0.06
		Exposure Point Total									1.1E-07					0.06
	Exposure Medium Total										1.1E-07					0.06
Medium Total											2.3E-06					0.07
										Total of Receptor Risks Across All Media	2.4E-06				Total of Receptor Hazards Across All Media	0.07

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	6.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-08	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.8E-07	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	8.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.4E-08	6.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.1E-07					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-09	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	9.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-08	7.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	6.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.0E-10	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-09	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.8E-08					--
		Exposure Point Total									6.0E-07					--
	Exposure Medium Total										6.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	3.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-13	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	2.6E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.9E-12	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	2.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-13	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	4.4E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.3E-13	3.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	1.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-13	9.4E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.1E-12					--
		Exposure Point Total									4.1E-12					--
	Exposure Medium Total										4.1E-12					--
Medium Total											6.0E-07					--
										Total of Receptor Risks Across All Media	6.0E-07				Total of Receptor Hazards Across All Media	--

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-06	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	3.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-07	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	9.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	6.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.4E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-09	9.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	9.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-08	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-08	5.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.6E-07					--
		Exposure Point Total									2.5E-06					--
	Exposure Medium Total										2.5E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	6.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-14	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	5.3E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.8E-13	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	4.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-14	8.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	8.9E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-13	1.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	2.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-14	5.4E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.3E-13					--
		Exposure Point Total									8.3E-13					--
	Exposure Medium Total										8.3E-13					--
Medium Total											2.5E-06					--
										Total of Receptor Risks Across All Media	2.5E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	1.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.4E-10	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	7.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.5E-07					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	5.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-09	8.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	4.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-08	7.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	3.4E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.5E-10	5.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	7.6E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-09	1.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-09	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.4E-08					--
		Exposure Point Total									1.9E-07					--
	Exposure Medium Total										1.9E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	4.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.8E-14	7.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	3.8E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.2E-13	6.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	2.9E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-14	4.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	6.4E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.6E-14	1.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	1.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-14	2.8E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.9E-13					--
		Exposure Point Total									5.9E-13					--
	Exposure Medium Total										5.9E-13					--
Medium Total											1.9E-07					--
										Total of Receptor Risks Across All Media	1.9E-07				Total of Receptor Hazards Across All Media	--

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	8.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-07	4.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	7.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-06	4.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	5.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.2E-08	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.5E-07	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.4E-06					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-08	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.0E-07	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	8.3E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.1E-09	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	5.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-08	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-06					--
		Exposure Point Total									8.4E-06					--
	Exposure Medium Total										8.4E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	1.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-12	7.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-11	6.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	9.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-12	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	2.0E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.4E-12	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	5.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-13	3.0E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-11					--
		Exposure Point Total									1.9E-11					--
	Exposure Medium Total										1.9E-11					--
Medium Total											8.4E-06					--
										Total of Receptor Risks Across All Media	8.4E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	7.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-08	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-07	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	5.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-09	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-08	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.7E-07					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-09	7.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.4E-08	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	7.7E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.6E-10	4.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-09	3.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.9E-08					--
		Exposure Point Total									7.7E-07					--
	Exposure Medium Total										7.7E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-12	7.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	1.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	6.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	7.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.5E-13	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	1.7E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.1E-12	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	4.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.2E-13	3.0E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-11					--
		Exposure Point Total									1.6E-11					--
	Exposure Medium Total										1.6E-11					--
Medium Total											7.7E-07					--
										Total of Receptor Risks Across All Media	7.7E-07				Total of Receptor Hazards Across All Media	--

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface Soil
9.3.RME	Child Recreational Users - Entire Site Surface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface Soil
9.6.RME	Child Residents - Entire Site Surface Soil
9.7.RME	Adult Residents - Entire Site Surface Soil
9.8.RME	Lifetime Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface Soil
9.5.CTE	Child Residents - Entire Site Surface Soil
9.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	2E-08	--	9E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	6E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	3E-07	--	1E-07	--	4E-07		--	--	--	--
		Exposure Point Total						4E-07					--
	Exposure Medium Total							4E-07					--
	Air	OU9	Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	--	- -	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Medium Total								4E-07					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.005	- -	--	0.005
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.02	- -	0.005	0.02
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0005	- -	0.0002	0.0008
			Benzo(a)anthracene	5E-07	--	2E-07	--	6E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	2E-06	--	7E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	4E-07	--	2E-07	--	6E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0009	- -	0.0004	0.001
			Benzo(k)fluoranthene	2E-08	--	6E-09	--	2E-08	NA	--	- -	--	--
			Chrysene	5E-09	--	2E-09	--	6E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	9E-07	--	3E-07	--	1E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.0007	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	2E-07	--	8E-08	--	3E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.003	- -	0.0010	0.004
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.002	0.006
			Pyrene	- -	--	- -	--	- -	Kidney	0.003	- -	0.001	0.005
			Chemical Total	7E-06	--	3E-06	--	1E-05		0.03	--	0.010	0.04
		Exposure Point Total						1E-05					0.04
	Exposure Medium Total							1E-05					0.04

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-08	--	--	4E-08	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Chrysene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Naphthalene	--	2E-07	--	--	2E-07	Nasal	- -	0.1	- -	0.1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.1	- -	0.1
		Exposure Point Total						2E-07					0.1
	Exposure Medium Total							2E-07					0.1
Medium Total								1E-05					0.2
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	0.2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.005
Total Blood HI	0.002
Total Body Weight HI	0.004
Total Kidney HI	0.01
Total Liver HI	0.003
Total Lungs HI	0.02
Total Nasal HI	0.1

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	3E-07	--	2E-07	--	5E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-08	--	2E-08	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	1E-07	--	1E-07	--	2E-07	NA	--	- -	--	--
			Chemical Total	3E-06	--	3E-06	--	6E-06		--	--	--	--
		Exposure Point Total						6E-06					--
	Exposure Medium Total							6E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								6E-06					--
Receptor Total							Receptor Risk Total	6E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	7E-07	--	5E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	6E-06	--	4E-06	--	1E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	8E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-07	--	2E-07	--	5E-07	NA	--	- -	--	--
			Chemical Total	8E-06	--	6E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								1E-05					--
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	5E-08	--	5E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	5E-07	--	9E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	3E-09	--	7E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-08	--	8E-08	--	2E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	2E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	6E-07	--	6E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-14	--	--	8E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	7E-07	--	5E-07	--	1E-06
			Benzo(a)pyrene	6E-06	--	5E-06	--	1E-05
			Benzo(k)fluoranthene	5E-08	--	4E-08	--	8E-08
			Dibenzo(a,h)anthracene	1E-06	--	8E-07	--	2E-06
			Indeno(1,2,3-cd)pyrene	3E-07	--	2E-07	--	5E-07
			Chemical Total	8E-06	--	6E-06	--	1E-05
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
	Air	OU9	Benzo(a)anthracene	--	5E-13	--	--	5E-13
			Benzo(a)pyrene	--	4E-12	--	--	4E-12
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13
			Dibenzo(a,h)anthracene	--	7E-13	--	--	7E-13
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13
			Chemical Total	--	6E-12	--	--	6E-12
		Exposure Point Total						6E-12
	Exposure Medium Total							6E-12
Medium Total								1E-05
Receptor Total							Receptor Risk Total	1E-05

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	5E-06	--	2E-06	--	6E-06	NA	--	- -	--	--
			Benzo(a)pyrene	4E-05	--	1E-05	--	6E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	--	3E-06	NA	--	- -	--	--
			Chemical Total	5E-05	--	2E-05	--	7E-05		--	--	--	--
		Exposure Point Total						7E-05					--
	Exposure Medium Total							7E-05					--
	Air	OU9	Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	7E-11	--	--	7E-11		- -	--	- -	--
		Exposure Point Total						7E-11					--
	Exposure Medium Total							7E-11					--
Medium Total								7E-05					--
Receptor Total							Receptor Risk Total	7E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	7E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	6E-06	--	3E-06	--	9E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	5E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	5E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	8E-06	--	4E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chemical Total	--	1E-10	--	--	1E-10		- -	--	- -	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Medium Total								1E-05					--
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	5E-06	--	2E-06	--	7E-06
			Benzo(a)pyrene	5E-05	--	2E-05	--	6E-05
			Benzo(k)fluoranthene	4E-07	--	1E-07	--	5E-07
			Dibenzo(a,h)anthracene	8E-06	--	3E-06	--	1E-05
			Indeno(1,2,3-cd)pyrene	2E-06	--	8E-07	--	3E-06
			Chemical Total	6E-05	--	2E-05	--	9E-05
		Exposure Point Total						9E-05
	Exposure Medium Total							9E-05
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(k)fluoranthene	--	9E-12	--	--	9E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Indeno(1,2,3-cd)pyrene	--	5E-12	--	--	5E-12
			Chemical Total	--	2E-10	--	--	2E-10
		Exposure Point Total						2E-10
	Exposure Medium Total							2E-10
Medium Total								9E-05
Receptor Total							Receptor Risk Total	9E-05

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	6E-09	--	1E-09	--	7E-09	NA	--	- -	--	--
			Benzo(a)pyrene	5E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-10	--	9E-11	--	5E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-09	--	2E-09	--	1E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-09	--	6E-10	--	3E-09	NA	--	- -	--	--
			Chemical Total	6E-08	--	2E-08	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Air	OU9	Benzo(a)anthracene	--	8E-11	--	--	8E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	--	- -	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
Medium Total								8E-08					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.004	- -	0.0008	0.005
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0002
			Benzo(a)anthracene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	--	0.00006	0.0003
			Benzo(k)fluoranthene	4E-09	--	1E-09	--	5E-09	NA	--	- -	--	--
			Chrysene	1E-09	--	3E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	6E-08	--	3E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0004	- -	0.00010	0.0005
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	5E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0006	- -	0.0002	0.0008
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.001	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0002	0.001
			Chemical Total	2E-06	--	5E-07	--	2E-06		0.009	--	0.002	0.01
		Exposure Point Total						2E-06					0.01
	Exposure Medium Total							2E-06					0.01

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Chrysene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Naphthalene	--	8E-08	--	--	8E-08	Nasal	- -	0.06	- -	0.06
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.06	- -	0.06
		Exposure Point Total						1E-07					0.06
	Exposure Medium Total							1E-07					0.06
Medium Total								2E-06					0.07
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.07

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0004
Total Body Weight HI	0.0008
Total Kidney HI	0.002
Total Liver HI	0.0008
Total Lungs HI	0.005
Total Nasal HI	0.06

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	4E-08	--	8E-09	--	5E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	7E-08	--	4E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	5E-10	--	3E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	1E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	3E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	9E-08	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-07					--
	Air	OU9	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Chemical Total	--	4E-12	--	--	4E-12		- -	--	- -	--
		Exposure Point Total						4E-12					--
	Exposure Medium Total							4E-12					--
Medium Total								6E-07					--
Receptor Total							Receptor Risk Total	6E-07				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	2E-07	--	5E-08	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-08	--	2E-08	--	9E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	6E-07	--	3E-06		--	--	--	--
		Exposure Point Total						3E-06					--
	Exposure Medium Total							3E-06					--
	Air	OU9	Benzo(a)anthracene	--	7E-14	--	--	7E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-14	--	--	4E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Chemical Total	--	8E-13	--	--	8E-13		- -	--	- -	--
		Exposure Point Total						8E-13					--
	Exposure Medium Total							8E-13					--
Medium Total								3E-06					--
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Benzo(a)pyrene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	8E-10	--	2E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	6E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	5E-09	--	2E-09	--	7E-09	NA	--	- -	--	--
			Chemical Total	1E-07	--	4E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	OU9	Benzo(a)anthracene	--	5E-14	--	--	5E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-14	--	--	8E-14	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Chemical Total	--	6E-13	--	--	6E-13		- -	--	- -	--
		Exposure Point Total						6E-13					--
	Exposure Medium Total							6E-13					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	2E-07				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	6E-07	--	9E-08	--	7E-07	NA	--	- -	--	--
			Benzo(a)pyrene	6E-06	--	8E-07	--	6E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	6E-09	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	9E-07	--	1E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-07	--	4E-08	--	3E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	1E-06	--	8E-06		--	--	--	--
		Exposure Point Total						8E-06					--
	Exposure Medium Total							8E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								8E-06					--
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	6E-08	--	9E-09	--	7E-08	NA	--	- -	--	--
			Benzo(a)pyrene	5E-07	--	7E-08	--	6E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-09	--	6E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-08	--	1E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	3E-09	--	3E-08	NA	--	- -	--	--
			Chemical Total	7E-07	--	1E-07	--	8E-07		--	--	--	--
		Exposure Point Total						8E-07					--
	Exposure Medium Total							8E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								8E-07					--
Receptor Total							Receptor Risk Total	8E-07				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

RAGS TABLES 7 and 9

EPCS Weighted 95% for samples without ash/burnt material

and

5% for samples with ash/burnt material

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.RME	Occupational Workers - Entire Site Surface Soil
7.3.RME	Child Recreational Users - Entire Site Surface Soil
7.4.RME	Adult Recreational Users - Entire Site Surface Soil
7.5.RME	Child Residents - Entire Site Surface Soil
7.6.RME	Adult Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
7.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.CTE	Occupational Workers - Entire Site Surface Soil
7.3.CTE	Child Recreational Users - Entire Site Surface Soil
7.4.CTE	Adult Recreational Users - Entire Site Surface Soil
7.5.CTE	Child Residents - Entire Site Surface Soil
7.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	2.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	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)	--
				Benzo(k)fluoranthene	0.60	mg/kg	1.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	3.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-09	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	9.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-09	6.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	8.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-08	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	6.5E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.7E-10	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	9.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	4.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-09	2.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.3E-08					--
		Exposure Point Total									3.0E-07					--
	Exposure Medium Total										3.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	6.2E-7	mg/m^3	1.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-10	8.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.5E-7	mg/m^3	1.1E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-09	7.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.2E-7	mg/m^3	8.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.0E-11	5.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.1E-8	mg/m^3	1.8E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.1E-10	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.6E-7	mg/m^3	5.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.6E-11	3.5E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.7E-09					--
		Exposure Point Total									1.7E-09					--
	Exposure Medium Total										1.7E-09					--
Medium Total											3.0E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	0.25	mg/kg	6.9E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				2-Methylnaphthalene	17.0	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.008
				Acenaphthylene	3	mg/kg	9.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	5	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.5E-08	9.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-06	9.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.3E-08	7.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	8.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	1.7	mg/kg	4.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.4E-09	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	1.3E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	9.3E-10	8.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	2.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	2.9	mg/kg	8.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	5.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-08	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0005
				Phenanthrene	12	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0008
				Pyrene	10	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0006
			Exp. Route Total								1.4E-06					0.01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17.0	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3	mg/kg	3.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00004
				Benzo(a)anthracene	5	mg/kg	5.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-08	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	5.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	4.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-08	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00007
				Benzo(k)fluoranthene	1.7	mg/kg	1.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-09	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	5.0E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.6E-10	3.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	9.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.9E-08	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	6.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	2.9	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	5.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	12	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	10	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								5.5E-07					0.004
		Exposure Point Total									2.0E-06					0.02
	Exposure Medium Total										2.0E-06					0.02
	Air	OU9	Inhalation	Mercury	1.7E-7	mg/m^3	3.4E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	1.3E-03	mg/m^3	2.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	3.3E-6	mg/m^3	6.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.1E-10	4.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-6	mg/m^3	6.8E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.5E-09	4.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.9E-6	mg/m^3	5.6E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.2E-10	3.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	2.0E-6	mg/m^3	4.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.2E-6	mg/m^3	2.3E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-10	1.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	3.2E-6	mg/m^3	6.3E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	6.9E-11	4.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	6.1E-7	mg/m^3	1.2E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-09	8.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	4.5E-6	mg/m^3	8.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.8E-5	mg/m^3	9.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-10	1.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.9E-04	mg/m^3	9.5E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.2E-08	6.7E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.02
				Phenanthrene	6.6E-4	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	6.9E-6	mg/m^3	1.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.5E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.3E-08					0.02
		Exposure Point Total									4.3E-08					0.02
	Exposure Medium Total										4.3E-08					0.02
Medium Total											2.0E-06					0.04
										Total of Receptor Risks Across All Media	2.3E-06				Total of Receptor Hazards Across All Media	0.04

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	8.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	7.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	2.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-08	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	4.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-08	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	7.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	1.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-08	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	3.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.1E-08	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-06					--
		Exposure Point Total									5.0E-06					--
	Exposure Medium Total										5.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	7.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.5E-13	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	6.9E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.6E-12	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	5.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-13	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	1.1E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-12	3.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	3.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-13	9.0E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-11					--
		Exposure Point Total									1.1E-11					--
	Exposure Medium Total										1.1E-11					--
Medium Total											5.0E-06					--
										Total of Receptor Risks Across All Media	5.0E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	7.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.4E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	6.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	5.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.7E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.9E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.4E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	5.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	3.6E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-08	8.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	7.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-07	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.7E-06					--
		Exposure Point Total									1.1E-05					--
	Exposure Medium Total										1.1E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	2.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-13	4.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	1.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.9E-12	3.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	1.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-13	2.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	2.9E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-13	6.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	8.2E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.1E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.7E-12					--
		Exposure Point Total									2.7E-12					--
	Exposure Medium Total										2.7E-12					--
Medium Total											1.1E-05					--
										Total of Receptor Risks Across All Media	1.1E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	5.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-08	9.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.7E-07	8.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	3.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.8E-09	6.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	8.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-08	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-08	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.9E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	5.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-08	9.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.8E-07	8.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	6.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	8.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.3E-08	1.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.1E-07					--
		Exposure Point Total									1.0E-06					--
	Exposure Medium Total										1.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	1.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-13	2.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	1.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-12	2.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	9.6E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	1.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	2.1E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.5E-13	3.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	5.9E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.5E-14	9.4E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-12					--
		Exposure Point Total									2.0E-12					--
	Exposure Medium Total										2.0E-12					--
Medium Total											- -					--
										Total of Receptor Risks Across All Media	1.0E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	5.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.4E-05	1.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	3.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.6E-07	7.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	7.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-06	4.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.5E-05					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	1.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-06	4.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	1.3E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.3E-08	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	6.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	7.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.7E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-05					--
		Exposure Point Total									6.1E-05					--
	Exposure Medium Total										6.1E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	4.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.6E-12	9.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	3.7E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.1E-11	8.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	2.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	6.1E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.3E-12	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	3.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.8E-11					--
		Exposure Point Total									5.8E-11					--
	Exposure Medium Total										5.8E-11					--
Medium Total											6.1E-05					--
										Total of Receptor Risks Across All Media	6.1E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	7.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	6.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	5.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-08	8.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-07	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.6E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	4.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-07	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	3.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-06	5.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	2.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-08	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	5.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-07	9.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-07	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-06					--
		Exposure Point Total									1.0E-05					--
	Exposure Medium Total										1.0E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	5.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.3E-12	9.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	5.1E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.6E-11	8.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	3.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	8.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.0E-11	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	2.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-12	3.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.9E-11					--
		Exposure Point Total									7.9E-11					--
	Exposure Medium Total										7.9E-11					--
Medium Total											1.0E-05					--
										Total of Receptor Risks Across All Media	1.0E-05				Total of Receptor Hazards Across All Media	--

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	6.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-09	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.0E-08	3.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	4.2E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.0E-10	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	9.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-09	6.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-09	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.3E-08					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	1.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-09	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	9.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	1.1E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.9E-11	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	2.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-09	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	6.7E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-10	4.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-08					--
		Exposure Point Total									6.7E-08					--
	Exposure Medium Total										6.7E-08					--
	Air	OU9	Inhalation	Benzo(a)anthracene	6.2E-7	mg/m^3	6.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-11	4.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.5E-7	mg/m^3	5.4E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.9E-10	3.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.2E-7	mg/m^3	4.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-11	2.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.1E-8	mg/m^3	8.9E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-10	6.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.6E-7	mg/m^3	2.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-11	1.8E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.4E-10					--
		Exposure Point Total									8.4E-10					--
	Exposure Medium Total										8.4E-10					--
Medium Total											6.8E-08					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	0.25	mg/kg	1.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				2-Methylnaphthalene	17.0	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3	mg/kg	2.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	5	mg/kg	3.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-07	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	2.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Benzo(k)fluoranthene	1.7	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.6E-10	8.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	3.2E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.3E-10	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	6.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.4E-08	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00008
				Fluorene	2.9	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00004
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	3.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	12	mg/kg	8.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	10	mg/kg	6.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								3.5E-07					0.003

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17.0	mg/kg	2.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0004
				Acenaphthylene	3	mg/kg	5.9E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000007
				Benzo(a)anthracene	5	mg/kg	8.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.2E-09	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	9.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-08	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	7.4E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.4E-09	5.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	5.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
				Benzo(k)fluoranthene	1.7	mg/kg	3.1E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.2E-10	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	8.3E-09	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.0E-11	5.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	1.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	1.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Fluorene	2.9	mg/kg	5.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000009
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	3.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	9.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Phenanthrene	12	mg/kg	2.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Pyrene	10	mg/kg	1.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
			Exp. Route Total								9.2E-08					0.0006
		Exposure Point Total									4.4E-07					0.004
	Exposure Medium Total										4.4E-07					0.004
	Air	OU9	Inhalation	Mercury	1.7E-7	mg/m^3	1.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	1.3E-03	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	3.3E-6	mg/m^3	3.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-10	2.3E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-6	mg/m^3	3.4E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.8E-09	2.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.9E-6	mg/m^3	2.8E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-10	2.0E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	2.0E-6	mg/m^3	2.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.2E-6	mg/m^3	1.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-10	8.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	3.2E-6	mg/m^3	3.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.5E-11	2.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	6.1E-7	mg/m^3	6.0E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.1E-10	4.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	4.5E-6	mg/m^3	4.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.8E-5	mg/m^3	4.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	9.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.9E-04	mg/m^3	4.8E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.6E-08	3.3E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.01
				Phenanthrene	6.6E-4	mg/m^3	6.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	6.9E-6	mg/m^3	6.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.7E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-08					0.01
		Exposure Point Total									2.2E-08					0.01
	Exposure Medium Total										2.2E-08					0.01
Medium Total											4.7E-07					0.01
										Total of Receptor Risks Across All Media	5.3E-07				Total of Receptor Hazards Across All Media	0.01

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	4.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-08	3.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	3.3E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.4E-09	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	7.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-08	5.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-08	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.2E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	8.4E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.1E-09	6.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	7.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-08	5.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	5.7E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.1E-10	4.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.0E-09	9.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.3E-08					--
		Exposure Point Total									5.0E-07					--
	Exposure Medium Total										5.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	2.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-13	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	2.2E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.4E-12	1.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	1.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-13	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	3.6E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.3E-13	2.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	7.9E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.4E-12					--
		Exposure Point Total									3.4E-12					--
	Exposure Medium Total										3.4E-12					--
Medium Total											5.0E-07					--
										Total of Receptor Risks Across All Media	5.0E-07				Total of Receptor Hazards Across All Media	--

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	1.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	1.3E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.1E-09	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	2.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	7.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-08	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	5.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.9E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	3.6E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-09	8.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	7.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	4.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.7E-07					--
		Exposure Point Total									2.1E-06					--
	Exposure Medium Total										2.1E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	5.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.5E-14	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	4.4E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.8E-13	9.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	3.3E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-14	7.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	7.2E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.7E-14	1.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	2.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-14	4.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.8E-13					--
		Exposure Point Total									6.8E-13					--
	Exposure Medium Total										6.8E-13					--
Medium Total											2.1E-06					--
										Total of Receptor Risks Across All Media	2.1E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.2E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	9.6E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.0E-10	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	5.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-09	9.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	4.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-09	6.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	3.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-08	6.0E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	2.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-10	4.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	6.2E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.5E-09	9.8E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-09	2.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.6E-08					--
		Exposure Point Total									1.6E-07					--
	Exposure Medium Total										1.6E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	3.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.9E-14	5.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	3.1E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.5E-13	5.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	2.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-14	3.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	5.2E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.2E-14	8.2E-14	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	1.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-14	2.3E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.9E-13					--
		Exposure Point Total									4.9E-13					--
	Exposure Medium Total										4.9E-13					--
Medium Total											1.6E-07					--
										Total of Receptor Risks Across All Media	1.6E-07				Total of Receptor Hazards Across All Media	--

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	7.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-07	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	6.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-06	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	4.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-08	2.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-07	5.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-08	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	9.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-07	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	6.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-09	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	4.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-08	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.9E-07					--
		Exposure Point Total									7.0E-06					--
	Exposure Medium Total										7.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	1.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	1.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	7.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.4E-13	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	1.7E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.0E-12	8.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	4.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.2E-13	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-11					--
		Exposure Point Total									1.6E-11					--
	Exposure Medium Total										1.6E-11					--
Medium Total											7.0E-06					--
										Total of Receptor Risks Across All Media	7.0E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	6.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-08	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-07	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	4.3E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-09	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	9.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-08	6.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-08	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.5E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	9.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-09	6.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	8.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-08	5.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	6.4E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.7E-10	4.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	8.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-09	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.2E-08					--
		Exposure Point Total									6.3E-07					--
	Exposure Medium Total										6.3E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	9.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	8.5E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.3E-12	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	6.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.1E-13	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	1.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-12	8.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	4.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-13	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-11					--
		Exposure Point Total									1.3E-11					--
	Exposure Medium Total										1.3E-11					--
Medium Total											6.3E-07					--
										Total of Receptor Risks Across All Media	6.3E-07				Total of Receptor Hazards Across All Media	--

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface Soil
9.3.RME	Child Recreational Users - Entire Site Surface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface Soil
9.6.RME	Child Residents - Entire Site Surface Soil
9.7.RME	Adult Residents - Entire Site Surface Soil
9.8.RME	Lifetime Residents - Entire Site Surface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface Soil
9.5.CTE	Child Residents - Entire Site Surface Soil
9.6.CTE	Adult Residents - Entire Site Surface Soil

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	2E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	6E-08	--	2E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	5E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	8E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	--	- -	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Medium Total								3E-07					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.002	- -	--	0.002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0001
			Benzo(a)anthracene	9E-08	--	4E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	8E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00007	0.0003
			Benzo(k)fluoranthene	3E-09	--	1E-09	--	5E-09	NA	--	- -	--	--
			Chrysene	9E-10	--	4E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	7E-08	--	2E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0001	0.0004
			Fluorene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0005	- -	0.0002	0.0007
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0006	- -	0.0002	0.0009
			Chemical Total	1E-06	--	5E-07	--	2E-06		0.01	--	0.004	0.02
		Exposure Point Total						2E-06					0.02
	Exposure Medium Total							2E-06					0.02

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Chrysene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.02	- -	0.02
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.02	- -	0.02
		Exposure Point Total						4E-08					0.02
	Exposure Medium Total							4E-08					0.02
Medium Total								2E-06					0.04
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.002
Total Blood HI	0.0003
Total Body Weight HI	0.0007
Total Kidney HI	0.002
Total Liver HI	0.0007
Total Lungs HI	0.01
Total Nasal HI	0.02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-08	--	1E-08	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-07	--	3E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-08	--	8E-08	--	2E-07	NA	--	- -	--	--
			Chemical Total	3E-06	--	2E-06	--	5E-06		--	--	--	--
		Exposure Point Total						5E-06					--
	Exposure Medium Total							5E-06					--
	Air	OU9	Benzo(a)anthracene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								5E-06					--
Receptor Total							Receptor Risk Total	5E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	4E-06	--	8E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	6E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	5E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								1E-05					--
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	3E-09	--	6E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	6E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	2E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-14	--	--	6E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	6E-07	--	4E-07	--	1E-06
			Benzo(a)pyrene	5E-06	--	4E-06	--	9E-06
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	7E-08
			Dibenzo(a,h)anthracene	9E-07	--	6E-07	--	1E-06
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07
			Chemical Total	7E-06	--	5E-06	--	1E-05
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13
			Benzo(a)pyrene	--	3E-12	--	--	3E-12
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13
			Chemical Total	--	5E-12	--	--	5E-12
		Exposure Point Total						5E-12
	Exposure Medium Total							5E-12
Medium Total								1E-05
Receptor Total							Receptor Risk Total	1E-05

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	4E-06	--	1E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-07	--	9E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-06	--	6E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	4E-05	--	2E-05	--	6E-05		--	--	--	--
		Exposure Point Total						6E-05					--
	Exposure Medium Total							6E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								6E-05					--
Receptor Total							Receptor Risk Total	6E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	6E-07	--	3E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	3E-06	--	8E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	3E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chemical Total	--	8E-11	--	--	8E-11		- -	--	- -	--
		Exposure Point Total						8E-11					--
	Exposure Medium Total							8E-11					--
Medium Total								1E-05					--
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-06	--	2E-06	--	6E-06
			Benzo(a)pyrene	4E-05	--	1E-05	--	5E-05
			Benzo(k)fluoranthene	3E-07	--	1E-07	--	4E-07
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	9E-06
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	--	3E-06
			Chemical Total	5E-05	--	2E-05	--	7E-05
		Exposure Point Total						7E-05
	Exposure Medium Total							7E-05
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(k)fluoranthene	--	7E-12	--	--	7E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Indeno(1,2,3-cd)pyrene	--	5E-12	--	--	5E-12
			Chemical Total	--	1E-10	--	--	1E-10
		Exposure Point Total						1E-10
	Exposure Medium Total							1E-10
Medium Total								7E-05
Receptor Total							Receptor Risk Total	7E-05

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	4E-09	--	1E-09	--	6E-09	NA	--	- -	--	--
			Benzo(a)pyrene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-10	--	8E-11	--	4E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-09	--	2E-09	--	8E-09	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-09	--	5E-10	--	2E-09	NA	--	- -	--	--
			Chemical Total	5E-08	--	1E-08	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	Air	OU9	Benzo(a)anthracene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Chemical Total	--	8E-10	--	--	8E-10		- -	--	- -	--
		Exposure Point Total						8E-10					--
	Exposure Medium Total							8E-10					--
Medium Total								7E-08					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.0004	- -	--	0.0004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	- -	0.0004	0.002
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000007	0.00003
			Benzo(a)anthracene	2E-08	--	6E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	3E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-08	--	5E-09	--	3E-08	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00005	--	0.00001	0.00006
			Benzo(k)fluoranthene	9E-10	--	2E-10	--	1E-09	NA	--	- -	--	--
			Chrysene	2E-10	--	6E-11	--	3E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00008	- -	0.00002	0.00010
			Fluorene	- -	--	- -	--	- -	Blood	0.00004	- -	0.000009	0.00004
			Indeno(1,2,3-cd)pyrene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0001	- -	0.00003	0.0002
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00005	0.0002
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00004	0.0002
			Chemical Total	4E-07	--	9E-08	--	4E-07		0.003	--	0.0006	0.004
		Exposure Point Total						4E-07					0.004
	Exposure Medium Total							4E-07					0.004

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Chrysene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Naphthalene	--	2E-08	--	--	2E-08	Nasal	- -	0.01	- -	0.01
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.01	- -	0.01
		Exposure Point Total						2E-08					0.01
	Exposure Medium Total							2E-08					0.01
Medium Total								5E-07					0.01
Receptor Total							Receptor Risk Total	5E-07				Receptor HI Total	0.01

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0004
Total Blood HI	0.00008
Total Body Weight HI	0.0002
Total Kidney HI	0.0004
Total Liver HI	0.0002
Total Lungs HI	0.002
Total Nasal HI	0.01

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	4E-08	--	6E-09	--	4E-08	NA	--	- -	--	--
			Benzo(a)pyrene	3E-07	--	5E-08	--	4E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-09	--	4E-10	--	3E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-08	--	9E-09	--	6E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	1E-08	--	3E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	4E-07	--	7E-08	--	5E-07		--	--	--	--
		Exposure Point Total						5E-07					--
	Exposure Medium Total							5E-07					--
	Air	OU9	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								5E-07					--
Receptor Total							Receptor Risk Total	5E-07				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-07	--	4E-08	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	9E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	6E-08	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	5E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	5E-14	--	--	5E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-14	--	--	4E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Chemical Total	--	7E-13	--	--	7E-13		- -	--	- -	--
		Exposure Point Total						7E-13					--
	Exposure Medium Total							7E-13					--
Medium Total								2E-06					--
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Benzo(a)pyrene	9E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	7E-10	--	2E-10	--	9E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	4E-09	--	1E-09	--	6E-09	NA	--	- -	--	--
			Chemical Total	1E-07	--	4E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	OU9	Benzo(a)anthracene	--	4E-14	--	--	4E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-14	--	--	6E-14	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Chemical Total	--	5E-13	--	--	5E-13		- -	--	- -	--
		Exposure Point Total						5E-13					--
	Exposure Medium Total							5E-13					--
Medium Total								2E-07					--
Receptor Total							Receptor Risk Total	2E-07				Receptor HI Total	--

Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.5.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	5E-07	--	8E-08	--	6E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	7E-07	--	5E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-08	--	5E-09	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	1E-07	--	9E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	9E-07	--	7E-06		--	--	--	--
		Exposure Point Total						7E-06					--
	Exposure Medium Total							7E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								7E-06					--
Receptor Total							Receptor Risk Total	7E-06				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	5E-08	--	7E-09	--	5E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	6E-08	--	5E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	5E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-08	--	1E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	3E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	6E-07	--	8E-08	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								6E-07					--
Receptor Total							Receptor Risk Total	6E-07				Receptor HI Total	--

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	--
Total Body Weight HI	--
Total Kidney HI	--
Total Liver HI	--
Total Lungs HI	--
Total Nasal HI	--

C.2 EXPOSURE ASSESSMENT AND EXAMPLE CALCULATIONS

C.2.1 CHEMICAL INTAKE ESTIMATION

The methodologies and techniques used to estimate exposure intakes are presented in this Appendix. Intakes for the identified potential receptor groups were calculated using current USEPA risk assessment guidance (e.g., USEPA, 1991, 1997, and 2004) and are presented in the risk assessment spreadsheets. All quantitative risk assessment results are presented in RAGS Part D format tables (Appendix C.1).

Non-carcinogenic intakes are estimated using the concept of an average annual exposure. Carcinogenic intakes are calculated as an incremental lifetime exposure, which assumes a life expectancy of 70 years. Equations used to calculate estimated intakes are provided below. Assumptions regarding exposure for all receptors and exposure pathways are presented in the RAGS Part D Table 4s which are provided in Appendix C.1.

Several general parameters (exposure duration, exposure frequency, body weight, and averaging time) are consistent for each potential receptor across all applicable exposure routes. Exposure frequencies of 150 days/year for the construction worker, 250 days/year for the occupational worker, and 350 days/year for the future resident (adult and child) (for soil) were used. These exposure frequencies are in accordance with current USEPA guidance (USEPA, December 2002a). Exposure durations are set at 1 year for the construction worker, 25 years for the occupational worker, 30 years (24 for the adult, 6 for the child) for the future resident, 24 years for the adult recreational user, and 6 years for the child recreational user). These exposure durations are based on USEPA (December 1989) guidance. Adults are assumed to weigh 70 kg, whereas the weight of children is assumed to be 15 kg (USEPA, August 1997). For all receptors, averaging time for non-carcinogenic effects is the associated exposure duration multiplied by 365 days/year. Averaging time for carcinogenic effects for all receptors is the estimated lifetime of a receptor, assumed to be 70 years, multiplied by 365 days/year.

C.2.1.1 <u>Incidental Ingestion of Soil</u>

Direct physical contact with surface and/or subsurface soil at OU9 may result in the incidental ingestion of chemicals. Chemical intake for the incidental ingestion of soil is estimated in the following manner (USEPA, December 1989):

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

where:

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

The majority of the exposure assumptions that will be used to estimate chemical intakes from incidental ingestion of soil are based on default assumptions described in the standard USEPA guidance and are provided in the RAGS Part D Table 4s (Appendix C.1).

There are no USEPA default recommendations for the exposure frequency for the construction worker or recreational user potentially exposed to soil. Consequently, the aforementioned exposure frequencies for the construction worker, child recreational users, and adult recreational users (150 days per year, 100 days per year, and 52 days per year, respectively) were derived based on professional judgment.

The incidental ingestion of a small amount of soil is assumed to occur when a receptor comes into direct contact with a contaminated medium. Exposure to surface and subsurface soil (0 to 10 feet bgs) is evaluated for construction workers. All other potential receptors are assumed to be exposed to surface soil (collected from depths of 0 to 2 feet bgs) only. For informational purposes, an evaluation of residents, recreational users, and occupational workers for exposure to subsurface soil (2 to 10 feet bgs) in addition to the other media is included in Appendix C.3.

For the RME scenario, the soil ingestion rate is set at 330 mg/day for the construction workers, 200 mg/day for the future child resident and child recreational user, and 100 mg/day for the other potential receptors (the occupational worker, adult recreational user, and adult resident) (USEPA, December 2002a). A value of 1.0 is assumed for the fraction of soil available from the contaminated source and ingested by all potential receptors except for recreational users. A value of 0.5 is used for the FI for recreational users because these receptors are assumed to be exposed to soil over shorter periods of time (i.e., they spend less time at the site) than other receptors.

A summary of the receptor-specific input values that will be used to estimate chemical intakes from incidental ingestion of soil are presented in the RAGS Part D Table 4s (Appendix C.1) for RME and CTE exposure scenarios, respectively.

C.2.1.2 Dermal Contact with Soil

During direct contact, potential receptors maybe dermally exposed to contaminated soil or sediment. Direct physical contact with soil may result in the dermal absorption of chemicals. Construction workers are evaluated for exposure to surface and subsurface soil to an estimated depth of 10 feet bgs, whereas all other potential receptors (occupational worker, recreational users [adult and adolescent], and hypothetical future residents) are assumed to be exposed to surface soil (collected from depths of 0 to 2 foot bgs) only. In addition, an evaluation of exposure of residents, recreational users, and occupational workers to surface (0 to 2 foot bgs) and subsurface soil (2 to 10 feet bgs) is included in Appendix C.3 for informational purposes only. Exposure associated with dermal contact with soil is estimated in the following manner (USEPA, December 1989):

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

where:

Intake	=	amount of chemical absorbed during contact with soil (mg/kg/day)
C_{soil}	=	concentration of chemical 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/yr)
ED	=	exposure duration (yr)
BW	=	body weight (kg)
AT	=	averaging time (days); for non-carcinogens, AT = ED x 365 days/yr; for carcinogens, AT = 70 yr x 365 days/yr

As suggested in the USEPA's Dermal Risk Assessment Guidance (USEPA, July 2004), the exposed skin surface areas for the RME and CTE are 5,700 cm^2/day for the adult resident, occupational worker, and construction worker and 2,800 cm^2/day for the future child resident.

Soils to skin adherence factors (for the RME and CTE) were also published in the 2004 Dermal Guidance. Skin surface areas and soil adherence factors used to evaluate exposures to soil or sediment are presented in Appendix C.1. The following dermal absorption factors (DABS; USEPA, July 2004) were used to estimate dermal risks from exposure to soil or sediment.

Because of the limited guidance available to estimate exposure to soil via dermal contact, the USEPA recommends performing a quantitative evaluation of risks for select chemicals. USEPA (July 2004) suggests dermal absorption factors for arsenic, cadmium, chlordane, 2,4-dichlorophenoxyacetic acid, DDT, 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), Lindane, PAHs [benzo(a)pyrene], PCBs (Aroclor 1254 and Aroclor 1242), and pentachlorophenol. The dermal route of exposure is evaluated quantitatively for these chemicals only if applicable. For chemicals lacking an ABS value in RAGS Part E, zero was used for the ABS value. Generic defaults only are suggested for semivolatile organic compounds and inorganics (0.1 and 0.01, respectively). Gastrointestinal (GI) absorption factors presented in the most recent USEPA dermal guidance (USEPA, July 2004) are used to calculate dermal cancer slope factors (CSFs) and dermal reference doses (RfDs).

Dermal Absorption Factors from Soil

Compound	Dermal Absorption Factor	Reference
Arsenic	0.03	Wester, et al. (1993a)
Cadmium	0.1	Wester, et al. (1992a) USEPA (1992a)
Chlordane	0.04	Wester, et al. (1992b)
Dioxins TCDD < 10% organic soil TCDD > 10% organic soil	 0.03 0.001	USEPA (1992a)
PAHs Benzo(a)pyrene	0.13	Wester, et al. (1990)
PCBs Aroclor 1254	0.14	Wester, et al. (1993b)
Remaining chemicals[1]	0	Remaining chemicals were not evaluated because RAGS Part E does not provide ABS values for these (USEPA, July 2004)

Source: Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, July 2004.

1. Guidance document recommends a dermal absorption factor of 0.1 for other semi-volatile organic compounds that are not specifically mentioned on the table.

The dermal absorption factor of 0.13 for benzo(a)pyrene was used for all PAHs following USEPA guidance (USEPA, July 2004).

For chemicals other than those listed above, 0 was used as the DABS value. Dermal exposures to volatile chemicals in soil are not evaluated as no USEPA approved dermal absorption values have been published.

C.2.1.3 Inhalation of Particulates

The amount of a chemical a receptor takes in as a result of respiration is determined using the concentration of the contaminant in air. Intakes of both particulates and vapors/gases are calculated using the same equation, presented in Appendix C.1 (USEPA, January 2009). All exposure factors for the identified receptor groups are outlined in the RAGS Part D Table 4s in Appendix C.1. The estimated concentrations of chemicals in air resulting from emissions from soil were developed following procedures presented in USEPA Soil Screening Guidance (USEPA, December 2002a). The chemical concentration in air is estimated using the equations presented in Appendix C.1. Intakes of both particulates and vapors/gases are calculated using the same equation, as follows (USEPA, January 2009):

$$EC = \frac{(C_{air})(ET)(EF)(ED)}{(AT)}$$

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/yr)
ED	=	exposure duration (yr)
AT	=	averaging time (hours);
	=	for non-carcinogens, AT = ED x 365 days/yr x 24 hours/day;
	=	for carcinogens, AT = 70 yr x 365 days/yr x 24 hours/day

The exposure assumptions that were used to estimate chemical intakes from inhalation of fugitive dusts/volatile emissions from surface and subsurface soils are based on default assumptions described in the standard USEPA guidance and are summarized in Appendix C.1. The same exposure frequencies and durations used to estimate incidental ingestion of soil intakes are used to estimate exposure via inhalation of fugitive dust/volatile emissions for surface and subsurface soils.

The concentrations of chemicals in air resulting from emissions from soil are developed following procedures presented in USEPA Soil Screening Guidance (USEPA, December 2002a). The chemical concentration in air is calculated from:

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

where:

C_{air}	=	chemical concentration in air, mg/m^3
C_{soil}	=	chemical concentration in soil, mg/kg
PEF	=	Particulate emission factor, m^3/kg
VF	=	volatilization factor, m^3/kg

The particulate emissions factor, PEF, relates the concentration of the chemical in soil with the concentration of dust particles in air. A PEF value of 9.37E+09 m^3/kg was obtained from USEPA's Soil Screening Internet site located at http://rais.ornl.gov/epa/ssl1.shtml. This is the default value for Portland, Maine which is the closest city to PNS 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 (1.43E+06 m^3/kg) was calculated using the equations presented in the supplemental SSL guidance document (USEPA, December 2002). Sample calculations for the PEFs are presented in Appendix C.2.

Ambient air concentrations resulting from the volatilization of COPCs from soil are chemical dependent and were calculated using the following equation from USEPA's Soil Screening Guidance:

$$VF = \frac{Q/C \times (3.14 \times D_a \times T)^{0.5} \times 10^{-4} \ (m^2 / cm^2)}{(2 \times \rho_b \times D_a)}$$

and

$$D_a = \frac{[(\theta_a^{10/3} \times D_i \times H' + \theta_w^{10/3} \times D_w)/n^2]}{\rho_b \times K_d + \theta_w + \theta_a \times H'}$$

where:

VF	=	volatilization factor (m^3-air/kg-soil)
Q/C	=	inverse of the mean concentration at the center of source (gm/m^2-sec per kg/m^3)
D_a	=	apparent diffusivity, chemical specific, (cm^2/sec)
T	=	exposure interval, exposure specific, (sec)
ρ_b	=	dry bulk soil particle density (g/cm^3)

θ_a = air-filled soil porosity (L_{air}/L_{soil})

D_i = diffusivity in air, chemical specific, (cm^2/sec)

n = total soil porosity (L_{pore}/L_{soil})

θ_w = water-filled soil porosity (L_{air}/L_{soil})

D_w = diffusivity in water, chemical specific, (cm^2/sec)

K_d = soil-water partition coefficient, chemical specific

H' = dimensionless Henry's law constant, chemical specific

Chemical properties were obtained from the Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites (USEPA, December 2002a).

C.2.1.4 Exposure Assessment and Risk Characterization of 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. In addition to the quantitative risk evaluation described in the preceding paragraphs, lead is evaluated using the IEUBK Version 1.1 Build 9 (USEPA, February 1994, May 2002, May 2009, and June 2009a) and the Adult Lead Model presented in the USEPA document entitled: "Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soils (USEPA, December 1996, January 2003)". The most current guidance for ALM input parameters (USEPA, June 2009b) was also used to evaluate adult lead exposures.

Lead was not selected as a COPC in surface soil or subsurface soil at OU9 but was evaluated as part of the additional risk estimates presented in Appendix C.3. The methodology presented in the previous section cannot be used to evaluate exposure to lead because of the absence of published dose-response parameters for this chemical. Exposure to lead is typically addressed using the USEPA IEUBK Model for lead (USEPA, February 1994, May 2002, May 2009, and June 2009a) for exposure to small children and the Technical Review Workgroup (TRW) ALM (USEPA, December 1996, January 2003). These models may be used to evaluate exposure to soil and are designed to estimate blood lead levels based on either default or site-specific input values. Additional guidance for the ALM was provided by the USEPA (USEPA, June 2009b). This guidance presented updated values for the default baseline blood lead concentration and the geometric standard deviation parameters used in the model. Both the USEPA and TRW guidance explicitly state that the average lead concentration is to be used as the exposure point concentration to be used in the model.

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 small children with elevated blood lead levels. The threshold for toxic effects from this chemical is believed to be in the range of 10 µg/dL to 15 µg/dL. Blood lead levels greater than 10 µg/dL are considered to be a "concern."

The aforementioned lead models are used to address exposure to lead for surface soil and subsurface soil at OU9 because the maximum detected site concentrations exceeded the associated screening levels. Results for the lead evaluations are presented in Appendix C.3.

C.2.1.5 Assessing Cancer Risks from Early Life Exposures

USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, March 2005b) recommends making adjustments to the toxicity of carcinogenic chemicals which act via the mutagenic mode of action when evaluating early life exposures. The guidance recommends using age dependent adjustment factors (ADAFs) combined with age specific exposure estimates when assessing cancer risks. In the absence of chemical specific data the supplement 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 2 years of age (i.e., spanning a 2-year interval from the first day of birth up until a child's second birthday), a 10-fold adjustment.

- For exposures between 2 and < 16 years of age (i.e., spanning a 14-year time interval from a child's second birthday up until their sixteenth birthday), a 3-fold adjustment.

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

The adjustments were applied using the same method used by USEPA in the development of the RSLs. Children were evaluated as two age groups, ages 0 to 2 years and ages 2 to 6 years; and adults were evaluated as two age groups, ages 6 to 17, and ages greater than 16 years old. Using this approach the intakes for recreational users and hypothetical residents were calculated as follows:

$$\text{Intake}_{\text{Child}} = \text{Intake}_{(\text{ages } 0 - 2 \text{ years})} \times 10 + \text{Intake}_{(\text{ages } 2 - 6 \text{ years})} \times 3$$

$$\text{Intake}_{\text{Adult}} = \text{Intake}_{(\text{ages } 6 - 16 \text{ years})} \times 3 + \text{Intake}_{(\text{ages} > 16 \text{ years})}$$

The above approach was used only for those chemicals which are identified as mutagenic in the USEPA RSL table (e.g., carcinogenic PAHs). Sample calculations demonstrating this approach are included in Appendix C.2.

CALCULATION OF AMBIENT AIR CONCENTRATION
SOURCE: U.S. EPA SOIL SCREENING GUIDANCE

Scenario Timeframe: Future	
Medium: Subsurface Soil	
Exposure Medium: Air	
Exposure Point:	OU9
Receptor Population:	Recreational User, Industrial Worker, or Resident
Receptor Age:	Child or Adult

Purpose: To calculate ambient air concentrations resulting from fugitive dust and volatilization from soil.

Relevant Equations:

$$Cair = Cs \times (1/PEF + 1/VF)$$

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4}\ m^2/cm^2}{2 \times pb \times DA}$$

$$PEF = \frac{3600}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$$

$$DA = \frac{[(\theta a^{10/3} \times Di \times H + \theta w^{10/3} \times Dw)/n^2)]}{pb \times Kd + \theta w + \theta a \times H}$$

$$Csat = S/pb \times (Kd \times pb + \theta w + H \times \theta a)$$

INPUT PARAMTERS		
Parameter	**Value**	**Definition**
Q/C = :	74.3185	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
T = :	9.5E+08	Exposure interval (seconds).
pb = :	1.5	Dry soil bulk density (g/cm^3).
ps = :	2.65	soil particle density (g/cm^3).
n = :	0.434	Total soil porosity (L_{pore}/L_{soil}).
θw = :	0.15	Water-filled soil porosity (L_{pore}/L_{soil}).
θa = :	0.284	Air-filled soil porosity (L_{air}/L_{soil}).
Di = :	Chemical specific	Diffusivity in air (cm^2/sec).
H' = :	Chemical specific	Dimensionless Henry's Law Constant.
Dw = :	Chemical specific	Diffusivity in water (cm^2/sec).
DA = :	Chemical specific	Apparent diffusivity (cm^2/sec).
Kd = :	Chemical specific	Soil-water partition coefficient (cm^3/g).
Koc = :	Chemical specific	Soil organic carbon partition coefficient (cm^3/g).
foc = :	0.006	Fraction organic carbon in soil (g/g).
F_D = :	1	dispersion correction factor
V =:	0.5	Fraction of vegatative cover (unitless)
Um =:	3.89	Mean annual wind speed (m/s)
Ut =:	11.32	equivalent threshold value of windspeed at 7 m (m/s)
F(x) =:	0.0391	Function dependent on Um/Ut
PEF = :	9.37E+09	Particulate emission factor (m^3/kg)

Chemical	**Volatile**	**Chemical Properties**					**Intermediate Calculations**			
		Koc (cm^3/g)	**Di (cm^2/sec)**	**Dw (cm^2/sec)**	**S (mg/L)**	**H'**	**Kd (cm^3/g)**	**Da (cm^2/sec)**	**VF (m^3/kg)**	**Csat (mg/kg)**
Subsurface Soil										
2-Methylnaphthalene	Y	2.48E+03	5.20E-02	7.80E-06	2.46E+01	2.10E-02	1.49E+01	3.89E-06	6.85E+04	3.68E+02
Acenaphthylene	Y	2.00E+03	4.39E-02	7.53E-06	1.61E+01	4.67E-03	1.20E+01	9.07E-07	1.42E+05	1.95E+02
Fluorene	Y	9.16E+03	4.40E-02	7.90E-06	1.69E+00	3.90E-03	5.50E+01	1.67E-07	3.30E+05	9.31E+01
Naphthalene	Y	1.54E+03	6.00E-02	8.40E-06	3.10E+01	1.80E-02	9.26E+00	6.15E-06	5.45E+04	2.90E+02
Phenanthrene	Y	4.80E+03	2.72E-02	7.24E-06	1.15E+00	3.92E-02	2.88E+01	1.96E-06	9.64E+04	3.33E+01

CALCULATION OF AMBIENT AIR CONCENTRATION
SOURCE: U.S. EPA SOIL SCREENING GUIDANCE

Scenario Timeframe: Current/Future	
Medium: Subsurface Soil	
Exposure Medium: Air	
Exposure Point:	OU9
Receptor Population:	Construction Worker
Receptor Age:	Adult

Purpose: To calculate ambient air concentrations resulting from fugitive dust and volatilization from soil.

Relevant Equations:

$$Cair = Cs \times (1/PEF + 1/VF)$$

$$VF = \frac{Q/C \times (3.14 \times DA \times T)^{1/2} \times 10^{-4}\ m^2/cm^2}{2 \times pb \times DA} \qquad PEF = \frac{3600}{0.036 \times (1 - V) \times (U_m / U_t)^3 \times F(x)}$$

$$DA = \frac{[(\theta a^{10/3} \times Di \times H + \theta w^{10/3} \times Dw)/n^2)]}{pb \times Kd + \theta w + \theta a \times H}$$

$$Csat = S/pb \times (Kd \times pb + \theta w + H \times \theta a)$$

INPUT PARAMTERS		
Parameter	**Value**	**Definition**
Q/C = :	14.31	Inverse of mean conc. at center of source (g/m^2-s per kg/m^3).
T = :	3.2E+07	Exposure interval (seconds).
pb = :	1.5	Dry soil bulk density (g/cm^3).
ps = :	2.65	soil particle density (g/cm^3).
n = :	0.434	Total soil porosity (L_{pore}/L_{soil}).
θw = :	0.15	Water-filled soil porosity (L_{pore}/L_{soil}).
θa = :	0.284	Air-filled soil porosity (L_{air}/L_{soil}).
Di = :	Chemical specific	Diffusivity in air (cm^2/sec).
H' = :	Chemical specific	Dimensionless Henry's Law Constant.
Dw = :	Chemical specific	Diffusivity in water (cm^2/sec).
DA = :	Chemical specific	Apparent diffusivity (cm^2/sec).
Kd = :	Chemical specific	Soil-water partition coefficient (cm^3/g).
Koc = :	Chemical specific	Soil organic carbon partition coefficient (cm^3/g).
foc = :	0.006	Fraction organic carbon in soil (g/g).
F_D = :	0.185	dispersion correction factor
V =:	0.5	Fraction of vegatative cover (unitless)
Um =:	3.4	Mean annual wind speed (m/s)
Ut =:	11.32	equivalent threshold value of windspeed at 7 m (m/s)
F(x) =:	0.0072	Function dependent on Um/Ut
PEF = :	1.43E+06	Particulate emission factor (m^3/kg)

Chemical	**Volatile**	**Chemical Properties**					**Intermediate Calculations**			
		Koc (cm^3/g)	**Di (cm^2/sec)**	**Dw (cm^2/sec)**	**S (mg/L)**	**H'**	**Kd (cm^3/g)**	**Da (cm^2/sec)**	**VF (m^3/kg)**	**Csat (mg/kg)**
Suubsurface Soil										
2-Methylnaphthalene	Y	2.48E+03	5.20E-02	7.80E-06	2.46E+01	2.10E-02	1.49E+01	3.89E-06	1.30E+04	3.68E+02
Acenaphthylene	Y	2.00E+03	4.39E-02	7.53E-06	1.61E+01	4.67E-03	1.20E+01	9.07E-07	2.69E+04	1.95E+02
Fluorene	Y	9.16E+03	4.40E-02	7.90E-06	1.69E+00	3.90E-03	5.50E+01	1.67E-07	6.28E+04	9.31E+01
Naphthalene	Y	1.54E+03	6.00E-02	8.40E-06	3.10E+01	1.80E-02	9.26E+00	6.15E-06	1.03E+04	2.90E+02
Phenanthrene	Y	4.80E+03	2.72E-02	7.24E-06	1.15E+00	3.92E-02	2.88E+01	1.96E-06	1.83E+04	3.33E+01

CALCULATION WORKSHEET

CLIENT: PORTSMOUTH NAVAL SHIPYARD		**JOB NUMBER:** 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CONSTRUCTION WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: L.GANSER	**CHECKED BY:**	**DATE:** 02/15/11

PURPOSE: To estimate intake, carcinogenic and non-carcinogenic risks from incidental ingestion of surface soil at OU9.

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	=	2	mg/kg	Chemical: Benzo(a)anthracene
IR	=	330	mg/day	
EF	=	150	days/year	
ED	=	1	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	365	days	
CSFo	=	7.3E-01	$(mg/kg/day)^{-1}$	
RfDo	=	N/A	(mg/kg/day)	

CLIENT: PORTSMOUTH NAVAL SHIPYARD		JOB NUMBER: 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL CONSTRUCTION WORKERS		
BASED ON: USEPA, DECEMBER 1989		
BY: L.GANSER	CHECKED BY:	DATE: 02/15/11

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{2\ mg/kg \times 330\ mg/day \times 150\ days/year \times 1\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{70\ kg \times 25550\ days}$$

IEXc = 5.54E-08 mg/kg/day

ILCR = 5.54E-08 mg/kg/day x 7.30E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 4.0E-08

EXAMPLE NON-CARCINOGENIC CALCULATION

$$IEXnc = \frac{2\ mg/kg \times 330\ mg/day \times 150\ days/year \times 1\ years \times 1 \times 1.0E\text{-}06\ kg/mg}{70\ kg \times 365\ days}$$

IEXnc = 3.87E-06 mg/kg/day

HQ = 3.87E-06 mg/kg/day / N/A (mg/kg/day) = Hazard Quotient

HQ = NA

CALCULATION WORKSHEET

CLIENT: PORTSMOUTH NAVAL SHIPYARD		**JOB NUMBER:** 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL CONSTRUCTION WORKERS		
BASED ON: USEPA, JULY 2004		
BY: L.GANSER	**CHECKED BY:**	**DATE:** 02/15/11

PURPOSE: To estimate intake, carcinogenic and non-carcinogenic risks from dermal contact with surface soil at OU9.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

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)
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	=	2	mg/kg	Chemical: Benzo(a)anthracene
CF	=	1.0E-06	kg/mg	
SA	=	3300	cm^2/day	
AF	=	0.3	mg/cm^2	
ABS	=	0.13		
EF	=	150	days/year	
ED	=	1	years	
BW	=	70	kg	
ATc	=	25550	days	
ATnc	=	365	days	
CSFd	=	7.3E-01	(mg/kg/day)$^{-1}$	
RfDd	=	NA	(mg/kg/day)	

CLIENT: PORTSMOUTH NAVAL SHIPYARD		JOB NUMBER: 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL CONSTRUCTION WORKERS		
BASED ON: USEPA, JULY 2004		
BY: L.GANSER	CHECKED BY:	DATE: 02/15/11

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{2\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 3300\ cm2/day \times 0.3\ mg/cm2 \times 0.13 \times 150\ days/year \times 1\ years}{70\ kg \times 25550\ days}$$

DEXc = 2.16E-08 mg/kg/day

ILCR = 2.16E-08 mg/kg/day x 7.30E-01 (mg/kg/day)-1 = Incremental Lifetime Cancer Risk

ILCR = 1.6E-08

EXAMPLE NONCARCINOGENIC CALCULATION

$$DEXnc = \frac{2\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 3300\ cm2/day \times 0.3\ mg/cm2 \times 0.13 \times 150\ days/year \times 1\ years}{70\ kg \times 365\ days}$$

DEXnc = 1.51E-06 mg/kg/day

HQ = 1.51E-06 mg/kg/day / NA (mg/kg/day) = Hazard Quotient

HQ = NA

CALCULATION WORKSHEET

CLIENT: PORTSMOUTH NAVAL SHIPYARD		**JOB NUMBER:** 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS CONSTRUCTION WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: L.GANSER	**CHECKED BY:**	**DATE:** 02/15/11

PURPOSE: To estimate intake, carcinogenic and non-carcinogenic risks from inhalation of surface soil at OU9.

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)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
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:

Cs	=	2	mg/kg	Chemical: Benzo(a)anthracene
PEF	=	1.43E+06	m3/kg	
Ca	=	1.40E-06	mg/m3	
ET	=	8	hours	
EF	=	150	days/year	
ED	=	1	years	
ATc	=	25550	days	
ATnc	=	365	days	
IURi	=	1.1E-04	$(ug/m3)^{-1}$	
RfCi	=	NA	(mg/m3)	

CLIENT: PORTSMOUTH NAVAL SHIPYARD		JOB NUMBER: 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS CONSTRUCTION WORKERS		
BASED ON: USEPA, JANUARY 2009		
BY: L.GANSER	CHECKED BY:	DATE: 02/15/11

EXAMPLE CARCINOGENIC CALCULATION

$$IEXc = \frac{1.40E\text{-}06 \text{ mg/m3} \times 8 \text{ hours} \times 150 \text{ days/year} \times 1 \text{ years}}{25550 \text{ days} \times 24 \text{ hours/day}}$$

IEXc = 2.74E-09 mg/m3

ILCR = 2.74E-09 mg/m3 x 1.10E-04 (ug/m3)-1 x 1000 ug/mg = Incremental Lifetime Cancer Risk

ILCR = 3.0E-10

EXAMPLE NON-CARCINOGENIC CALCULATION

$$IEXnc = \frac{1.40E\text{-}06 \text{ mg/m3} \times 8 \text{ hours} \times 150 \text{ days/year} \times 1 \text{ years}}{365 \text{ days} \times 24 \text{ hours/day}}$$

IEXnc = 1.92E-07 mg/m3

HQ = 1.92E-07 mg/m3 / NA (mg/m3) = Hazard Quotient

HQ **NA**

CLIENT:	JOB NUMBER:
PORTSMOUTH NAVAL SHIPYARD	02214

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:	CHECKED BY:	DATE:
M. KRAUS	L. Ciofani	02/14/11

Equation 5-5
Derivation of the Particulate Emission Factor
Construction Scenario - Construction Worker

$$PEF_{sc} = Q/C_{sr} \times \frac{1}{F_D} \times \left[\frac{T \times A_R}{556 \times \left(\frac{W}{3}\right)^{0.4} \times \frac{(365d/yr - p)}{365d/yr} \times VKT} \right]$$

Parameter/Definition (units)	Default
PEF_{sc}/subchronic road particulate emission factor (m^3/kg)	site-specific
Q/C_{sr}/ inverse of 1-h average air concentration along a straight road segment bisecting a 0.5-acre square site (g/m^2-s per kg/m^3)	23.02
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) (see Figure 5-2)	site-specific
• VKT/sum of fleet vehicle kilometers traveled during the exposure duration (km)	site-specific

Calculation of PEF for Construction Workers

Q/C	23.02	(g/m2-s per kg/m3)	
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

CALCULATION WORKSHEET

CLIENT: PORTSMOUTH NAVAL SHIPYARD		**JOB NUMBER:** 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS EXPOSED TO SURFACE SOIL		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: M. KRAUS	**CHECKED BY:** L. Cinfani	**DATE:** 12/21/10

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from incidental ingestion of surface soil at OU9.

EQUATION:

$$IEX = \frac{CS \times IR \times EF \times ED \times FI \times CF}{BW \times AT} \times ADAF$$

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)
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:

Cs	=	0.3	mg/kg	Chemical: Dibenzo(a,h)anthracene
IR	=	200	mg/day	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
FI	=	1		
CF	=	1.0E-06	kg/mg	
BW	=	15	kg	
AT	=	25550	days	
CSFo	=	7.3E+00	$(mg/kg/day)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: PORTSMOUTH NAVAL SHIPYARD		JOB NUMBER: 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INCIDENTAL INGESTION OF SOIL FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS EXPOSED TO SURFACE SOIL		
BASED ON: U.S. EPA, DECEMBER 1989		
BY: M. KRAUS	CHECKED BY: L. Cifani	DATE: 12/21/10

EXAMPLE CARCINOGENIC CALCULATION

$$IEX_1 = \frac{0.3 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/year} \times 2 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 10$$

IEX_1 = 1.10E-06 mg/kg/day

$$IEX_2 = \frac{0.3 \text{ mg/kg} \times 200 \text{ mg/day} \times 350 \text{ days/year} \times 4 \text{ years} \times 1 \times 1.0\text{E-06 kg/mg}}{15 \text{ kg} \times 25550 \text{ days}} \times 3$$

IEX_2 = 6.58E-07 mg/kg/day

ILCR = (1.10E-06 mg/kg/day + 6.58E-07 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 1.3E-05

CLIENT: PORTSMOUTH NAVAL SHIPYARD		JOB NUMBER: 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS EXPOSED TO SURFACE SOIL		
BASED ON: U.S. EPA, JULY 2004		
BY: M. KRAUS	CHECKED BY: L. Ciffani	DATE: 12/21/10

PURPOSE: To estimate intake and cancer risks for mutagenic chemicals from dermal contact with surface soil at OU9.

EQUATION:

$$DEX = \frac{Cs \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT} \times ADAF$$

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)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
BW	=	body weight (kg)
AT	=	averaging time (days)
ADAF	=	age-dependent adjustment factor
CSFd	=	dermal carcinogenic slope factor ((mg/kg/day)$^{-1}$)

RISKS:

ILCR (Carcinogens) = Intake (mg/kg/day) x CSFd (mg/kg/day)-1

ASSUMPTIONS:

Cs	=	0.3	mg/kg	Chemical: Dibenzo(a,h)anthracene
CF	=	1.0E-06	kg/mg	
SA	=	2800	cm^2/day	
AF	=	0.2	mg/cm^2	
ABS	=	0.13		
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
BW	=	15	kg	
AT	=	25550	days	
CSFd	=	7.3E+00	(mg/kg/day)$^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: PORTSMOUTH NAVAL SHIPYARD		JOB NUMBER: 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM DERMAL CONTACT WITH SOIL FOR MUTAGENIC CHEMICALS HYPOTHETICAL CHILD RESIDENTS EXPOSED TO SURFACE SOIL		
BASED ON: U.S. EPA, JULY 2004		
BY: M. KRAUS	CHECKED BY: L. Ciofani	DATE: 12/21/10

EXAMPLE CARCINOGENIC CALCULATION

$$DEXc = \frac{0.3\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 350\ days/year \times 2\ years}{15\ kg \times 25550\ days} \times 10$$

DEXc = 3.99E-07 mg/kg/day

$$DEXc = \frac{0.3\ mg/kg \times 1.0E\text{-}06\ kg/mg \times 2800\ cm2/day \times 0.2\ mg/cm2 \times 0.13 \times 350\ days/year \times 4\ years}{15\ kg \times 25550\ days} \times 3$$

DEXc = 2.39E-07 mg/kg/day

ILCR = (3.99E-07 mg/kg/day + 2.39E-07 mg/kg/day) x 7.30E+00 (mg/kg/day)-1

ILCR = 4.7E-06

CALCULATION WORKSHEET

CLIENT: PORTSMOUTH NAVAL SHIPYARD		**JOB NUMBER:** 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005, January 2009		
BY: M. KRAUS	**CHECKED BY:** L. Crofani	**DATE:** 12/21/10

PURPOSE: To estimate intake, carcinogenic risks for mutagenic chemicals from inhalation of surface soil at OU9.

EQUATION:

$$EC = \frac{Ca \times ET \times EF \times ED}{AT} \times ADAF$$

Where:

EC	=	estimated exposure concentration (mg/m3)
Ca	=	exposure point concentration in air (mg/m3)
	=	Cs x 1/PEF
Cs	=	exposure point concentration in soil (mg/kg)
PEF	=	particulate emission factor (m3/kg)
ET	=	exposure time (hrs/day)
EF	=	exposure frequency (days/year)
ED	=	exposure duration (years)
AT	=	averaging time (hours)
ADAF	=	age-dependent adjustment factor
IURi	=	inhalation unit risk($(ug/mg)^{-1}$)

RISKS:

ILCR = Exposure concentration (mg/m3) x IURi (ug/m3)-1 x 1000 ug/mg

ASSUMPTIONS:

Cs	=	0.3	mg/kg	Chemical: Dibenzo(a,h)anthracene
PEF	=	9.37E+09	m3/kg	
Ca	=	3.20E-11	mg/m3	
ET	=	24	hr/day	
EF	=	350	days/year	
ED_1	=	2	years	
ED_2	=	4	years	
ATc	=	613200	days	
IURi	=	1.1E-03	$(ug/m3)^{-1}$	
$ADAF_1$	=	10		
$ADAF_2$	=	3		

CLIENT: PORTSMOUTH NAVAL SHIPYARD		**JOB NUMBER:** 02214
SUBJECT: CALCULATION OF INTAKE/RISK FROM INHALATION OF FUGATIVE DUST EMISSIONS FOR MUTAGENIC CHEMICALS - HYPOTHETICAL CHILD RESIDENTS		
BASED ON: USEPA, DECEMBER 1989, MARCH 2005, January 2009		
BY: M. KRAUS	**CHECKED BY:** L. Cuffari	**DATE:** 12/21/10

EXAMPLE CARCINOGENIC CALCULATION

$$EC = \frac{3.20E\text{-}11\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 2\ years}{613200\ days} \times 10$$

EC = 8.77E-12 mg/m3

$$EC = \frac{3.20E\text{-}11\ mg/m3 \times 24\ hr/day \times 350\ days/year \times 4\ years}{613200\ days} \times 3$$

EC = 5.26E-12 mg/m3

ILCR = (8.77E-12 mg/m3 + 5.26E-12 mg/m3) x 1.10E-03 (ug/m3)-1 x 1000 ug/mg

ILCR = 1.5E-11

CLIENT	JOB NUMBER
OU9	112G02214

SUBJECT: Calculate Weighted EPC for Benzo(a) anthracene - 95% non-ash and 5% ash evaluation

BASED ON	DRAWING NUMBER
T-Statistic	

BY	CHECKED BY	APPROVED BY	DATE
L. Ciofani	MK	MR	01/13/12

Weighted average = W1 × X1 + W2 × X2

where: W1 = Weight of non-ash = 0.95
W2 = weight of ash = 0.05
X1 = average of non-ash
X2 = average of ash

Weighted average for benzo(a) anthracene = 0.95 × 263.7 ug/kg + 0.05 × 75585.8 ug/kg

= 4029.8 ug/kg ✓

Weighted variance = $(W1^2 \times S1^2/N1) + (W2^2 \times S2^2/N2)$

where: W1 = weight of non-ash = 0.95
W2 = weight of ash = 0.05
S1 = Standard deviation of non-ash samples
S2 = Standard deviation of ash samples
N1 = Sample size for non-ash samples
N2 = Sample size for ash samples

Weighted variance for benzo(a) anthracene $= [(0.95)^2 \times (798.8 \text{ ug/kg})^2/29] + [(0.05)^2 \times (136{,}859 \text{ ug/kg})^2/9)]$

$= 5{,}222{,}741 \text{ ug/kg}^2$

Weighted Standard Deviation = $\sqrt{\text{weighted variance}}$

= 2285 ug/kg for benzo(a)anthracene

CLIENT OU9		JOB NUMBER 112G02214	
SUBJECT Calculate Weighted EPC for Benzo(a)anthracene - 95% non-ash and 5% ash evaluation			
BASED ON T-statistic		DRAWING NUMBER	
BY L.Ciofani	CHECKED BY MK	APPROVED BY MK	DATE 01/13/12

$$\text{Weighted UCL} = \text{Weighted Average} + \frac{\text{Tstatistic} \times \text{Weighted Standard Deviation}}{\sqrt{n}}$$

where: Tstatistic (95, n-1) = based on the total sample size of 38 samples = 1.687094

n = total sample size = 38

$$\text{Weighted UCL for benzo(a)anthracene} = 4029.8\ \text{ug/kg} + \frac{1.687094 \times 2285\ \text{ug/kg}}{\sqrt{38}}$$

$$= 4655\ \text{ug/kg}$$

Surface Soil EPCs

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Benzo(a)anthracene											
10												
11						General Statistics						
12						Number of Valid Data	19				Number of Detected Data	18
13						Number of Distinct Detected Data	17				Number of Non-Detect Data	1
14						Number of Missing Values	1				Percent Non-Detects	5.26%
15												
16						Raw Statistics					Log-transformed Statistics	
17						Minimum Detected	10				Minimum Detected	2.303
18						Maximum Detected	4250				Maximum Detected	8.355
19						Mean of Detected	770.5				Mean of Detected	5.343
20						SD of Detected	1305				SD of Detected	1.792
21						Minimum Non-Detect	3.8				Minimum Non-Detect	1.335
22						Maximum Non-Detect	3.8				Maximum Non-Detect	1.335
23												
24												
25						UCL Statistics						
26						Normal Distribution Test with Detected Values Only					Lognormal Distribution Test with Detected Values Only	
27						Shapiro Wilk Test Statistic	0.607				Shapiro Wilk Test Statistic	0.96
28						5% Shapiro Wilk Critical Value	0.897				5% Shapiro Wilk Critical Value	0.897
29						Data not Normal at 5% Significance Level					Data appear Lognormal at 5% Significance Level	
30												
31						Assuming Normal Distribution					Assuming Lognormal Distribution	
32						DL/2 Substitution Method					DL/2 Substitution Method	
33						Mean	730				Mean	5.095
34						SD	1281				SD	2.049
35						95% DL/2 (t) UCL	1239				95% H-Stat (DL/2) UCL	10805
36												
37						Maximum Likelihood Estimate(MLE) Method					Log ROS Method	
38						Mean	687				Mean in Log Scale	5.111
39						SD	1293				SD in Log Scale	2.014
40						95% MLE (t) UCL	1202				Mean in Original Scale	730.1
41						95% MLE (Tiku) UCL	1159				SD in Original Scale	1281
42											95% t UCL	1239
43											95% Percentile Bootstrap UCL	1208
44											95% BCA Bootstrap UCL	1352
45											95% H UCL	9602
46												
47						Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only	
48						k star (bias corrected)	0.444				Data appear Gamma Distributed at 5% Significance Level	
49						Theta Star	1734					
50						nu star	16					

	A–E	F	G–K	L
51				
52	A-D Test Statistic	0.771	**Nonparametric Statistics**	
53	5% A-D Critical Value	0.802	Kaplan-Meier (KM) Method	
54	K-S Test Statistic	0.802	Mean	730.5
55	5% K-S Critical Value	0.215	SD	1246
56	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	294.2
57			95% KM (t) UCL	1241
58	**Assuming Gamma Distribution**		95% KM (z) UCL	1214
59	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1240
60	Minimum	0.000001	95% KM (bootstrap t) UCL	1690
61	Maximum	4250	95% KM (BCA) UCL	1263
62	Mean	729.9	95% KM (Percentile Bootstrap) UCL	1223
63	Median	230	95% KM (Chebyshev) UCL	2013
64	SD	1281	97.5% KM (Chebyshev) UCL	2568
65	k star	0.292	99% KM (Chebyshev) UCL	3657
66	Theta star	2503		
67	Nu star	11.08	**Potential UCLs to Use**	
68	AppChi2	4.627	95% KM (Chebyshev) UCL	2013
69	95% Gamma Approximate UCL	1748		
70	95% Adjusted Gamma UCL	1895		
71	**Note: DL/2 is not a recommended method.**			
72				
73	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
74	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**			
75	**For additional insight, the user may want to consult a statistician.**			
76				
77				
78	**Benzo(a)pyrene**			
79				
80	**General Statistics**			
81	Number of Valid Data	19	Number of Detected Data	18
82	Number of Distinct Detected Data	17	Number of Non-Detect Data	1
83	Number of Missing Values	1	Percent Non-Detects	5.26%
84				
85	**Raw Statistics**		**Log-transformed Statistics**	
86	Minimum Detected	11	Minimum Detected	2.398
87	Maximum Detected	4110	Maximum Detected	8.321
88	Mean of Detected	681.1	Mean of Detected	5.241
89	SD of Detected	1194	SD of Detected	1.712
90	Minimum Non-Detect	3.8	Minimum Non-Detect	1.335
91	Maximum Non-Detect	3.8	Maximum Non-Detect	1.335
92				
93				
94	**UCL Statistics**			
95	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
96	Shapiro Wilk Test Statistic	0.593	Shapiro Wilk Test Statistic	0.952
97	5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
98	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
99				
100	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	

	A–E	F	G–K	L
101	DL/2 Substitution Method		DL/2 Substitution Method	
102	Mean	645.4	Mean	4.999
103	SD	1171	SD	1.97
104	95% DL/2 (t) UCL	1111	95% H-Stat (DL/2) UCL	7247
105				
106	Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
107	Mean	605.7	Mean in Log Scale	5.02
108	SD	1182	SD in Log Scale	1.922
109	95% MLE (t) UCL	1076	Mean in Original Scale	645.4
110	95% MLE (Tiku) UCL	1036	SD in Original Scale	1171
111			95% t UCL	1111
112			95% Percentile Bootstrap UCL	1106
113			95% BCA Bootstrap UCL	1278
114			95% H UCL	6185
115				
116	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
117	k star (bias corrected)	0.45	**Data appear Lognormal at 5% Significance Level**	
118	Theta Star	1513		
119	nu star	16.2		
120				
121	A-D Test Statistic	1.026	**Nonparametric Statistics**	
122	5% A-D Critical Value	0.801	Kaplan-Meier (KM) Method	
123	K-S Test Statistic	0.801	Mean	645.8
124	5% K-S Critical Value	0.215	SD	1139
125	**Data not Gamma Distributed at 5% Significance Level**		SE of Mean	268.9
126			95% KM (t) UCL	1112
127	**Assuming Gamma Distribution**		95% KM (z) UCL	1088
128	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1111
129	Minimum	0.000001	95% KM (bootstrap t) UCL	1470
130	Maximum	4110	95% KM (BCA) UCL	1130
131	Mean	645.3	95% KM (Percentile Bootstrap) UCL	1103
132	Median	180	95% KM (Chebyshev) UCL	1818
133	SD	1171	97.5% KM (Chebyshev) UCL	2325
134	k star	0.294	99% KM (Chebyshev) UCL	3321
135	Theta star	2193		
136	Nu star	11.18	**Potential UCLs to Use**	
137	AppChi2	4.691	99% KM (Chebyshev) UCL	3321
138	95% Gamma Approximate UCL	1538		
139	95% Adjusted Gamma UCL	1666		
140	**Note: DL/2 is not a recommended method.**			
141				
142	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
143	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**			
144	**For additional insight, the user may want to consult a statistician.**			
145				
146				
147	**Benzo(k)fluoranthene**			
148				
149	**General Statistics**			
150	Number of Valid Data	19	Number of Detected Data	18

	A–E	F	G–K	L
151	Number of Distinct Detected Data	16	Number of Non-Detect Data	1
152	Number of Missing Values	1	Percent Non-Detects	5.26%
153				
154	**Raw Statistics**		**Log-transformed Statistics**	
155	Minimum Detected	4.3	Minimum Detected	1.459
156	Maximum Detected	2745	Maximum Detected	7.918
157	Mean of Detected	513	Mean of Detected	4.865
158	SD of Detected	906.2	SD of Detected	1.809
159	Minimum Non-Detect	3.8	Minimum Non-Detect	1.335
160	Maximum Non-Detect	3.8	Maximum Non-Detect	1.335
161				
162				
163	**UCL Statistics**			
164	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
165	Shapiro Wilk Test Statistic	0.572	Shapiro Wilk Test Statistic	0.954
166	5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
167	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
168				
169	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
170	DL/2 Substitution Method		DL/2 Substitution Method	
171	Mean	486.1	Mean	4.643
172	SD	888.4	SD	2.007
173	95% DL/2 (t) UCL	839.5	95% H-Stat (DL/2) UCL	5856
174				
175	Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
176	Mean	456	Mean in Log Scale	4.633
177	SD	897	SD in Log Scale	2.029
178	95% MLE (t) UCL	812.8	Mean in Original Scale	486.1
179	95% MLE (Tiku) UCL	782.6	SD in Original Scale	888.4
180			95% t UCL	839.5
181			95% Percentile Bootstrap UCL	853.3
182			95% BCA Bootstrap UCL	958.3
183			95% H UCL	6298
184				
185	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
186	k star (bias corrected)	0.426	**Data appear Lognormal at 5% Significance Level**	
187	Theta Star	1204		
188	nu star	15.34		
189				
190	A-D Test Statistic	1.07	**Nonparametric Statistics**	
191	5% A-D Critical Value	0.807	Kaplan-Meier (KM) Method	
192	K-S Test Statistic	0.807	Mean	486.2
193	5% K-S Critical Value	0.216	SD	864.6
194	**Data not Gamma Distributed at 5% Significance Level**		SE of Mean	204.1
195			95% KM (t) UCL	840.2
196	**Assuming Gamma Distribution**		95% KM (z) UCL	822
197	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	839.5
198	Minimum	0.000001	95% KM (bootstrap t) UCL	1058
199	Maximum	2745	95% KM (BCA) UCL	878.2
200	Mean	486	95% KM (Percentile Bootstrap) UCL	825.6

	A	B	C	D	E	F	G	H	I	J	K	L
201					Median	140					95% KM (Chebyshev) UCL	1376
202					SD	888.5					97.5% KM (Chebyshev) UCL	1761
203					k star	0.287					99% KM (Chebyshev) UCL	2517
204					Theta star	1692						
205					Nu star	10.91					**Potential UCLs to Use**	
206					AppChi2	4.521					99% KM (Chebyshev) UCL	2517
207					95% Gamma Approximate UCL	1173						
208					95% Adjusted Gamma UCL	1273						
209	**Note: DL/2 is not a recommended method.**											
210												
211	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
212	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
213	**For additional insight, the user may want to consult a statistician.**											
214												
215												
216	**Dibenzo(a,h)anthracene**											
217												
218					**General Statistics**							
219					Number of Valid Data	19					Number of Detected Data	16
220					Number of Distinct Detected Data	15					Number of Non-Detect Data	3
221					Number of Missing Values	1					Percent Non-Detects	15.79%
222												
223					**Raw Statistics**						**Log-transformed Statistics**	
224					Minimum Detected	4.3					Minimum Detected	1.459
225					Maximum Detected	865					Maximum Detected	6.763
226					Mean of Detected	128.2					Mean of Detected	3.985
227					SD of Detected	214.7					SD of Detected	1.344
228					Minimum Non-Detect	3.7					Minimum Non-Detect	1.308
229					Maximum Non-Detect	4					Maximum Non-Detect	1.386
230												
231	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	3
232	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	16
233	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	15.79%
234												
235					**UCL Statistics**							
236					**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**	
237					Shapiro Wilk Test Statistic	0.578					Shapiro Wilk Test Statistic	0.985
238					5% Shapiro Wilk Critical Value	0.887					5% Shapiro Wilk Critical Value	0.887
239					**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**	
240												
241					**Assuming Normal Distribution**						**Assuming Lognormal Distribution**	
242					DL/2 Substitution Method						DL/2 Substitution Method	
243					Mean	108.3					Mean	3.458
244					SD	201.6					SD	1.751
245					95% DL/2 (t) UCL	188.5					95% H-Stat (DL/2) UCL	709.3
246												
247					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
248					Mean	85.03					Mean in Log Scale	3.496
249					SD	220.4					SD in Log Scale	1.688
250					95% MLE (t) UCL	172.7					Mean in Original Scale	108.4

	A–E	F	G–K	L
251	95% MLE (Tiku) UCL	169.1	SD in Original Scale	201.6
252			95% t UCL	188.6
253			95% Percentile Bootstrap UCL	198.4
254			95% BCA Bootstrap UCL	237.3
255			95% H UCL	599.4
256				
257	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
258	k star (bias corrected)	0.607	**Data appear Gamma Distributed at 5% Significance Level**	
259	Theta Star	211.2		
260	nu star	19.43		
261				
262	A-D Test Statistic	0.685	**Nonparametric Statistics**	
263	5% A-D Critical Value	0.779	Kaplan-Meier (KM) Method	
264	K-S Test Statistic	0.779	Mean	108.7
265	5% K-S Critical Value	0.224	SD	196
266	**Data appear Gamma Distributed at 5% Significance Level**		SE of Mean	46.44
267			95% KM (t) UCL	189.2
268	**Assuming Gamma Distribution**		95% KM (z) UCL	185.1
269	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	188
270	Minimum	0.000001	95% KM (bootstrap t) UCL	305.8
271	Maximum	865	95% KM (BCA) UCL	204.4
272	Mean	108	95% KM (Percentile Bootstrap) UCL	189
273	Median	35	95% KM (Chebyshev) UCL	311.1
274	SD	201.8	97.5% KM (Chebyshev) UCL	398.7
275	k star	0.211	99% KM (Chebyshev) UCL	570.8
276	Theta star	512.7		
277	Nu star	8.003	**Potential UCLs to Use**	
278	AppChi2	2.737	95% KM (Chebyshev) UCL	311.1
279	95% Gamma Approximate UCL	315.8		
280	95% Adjusted Gamma UCL	349.3		
281	**Note: DL/2 is not a recommended method.**			
282				
283	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**			
284	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**			
285	**For additional insight, the user may want to consult a statistician.**			
286				
287				
288	**Indeno(1,2,3-cd)pyrene**			
289				
290	**General Statistics**			
291	Number of Valid Data	19	Number of Detected Data	18
292	Number of Distinct Detected Data	16	Number of Non-Detect Data	1
293	Number of Missing Values	1	Percent Non-Detects	5.26%
294				
295	**Raw Statistics**		**Log-transformed Statistics**	
296	Minimum Detected	5.2	Minimum Detected	1.649
297	Maximum Detected	1860	Maximum Detected	7.528
298	Mean of Detected	322.4	Mean of Detected	4.58
299	SD of Detected	551.8	SD of Detected	1.65
300	Minimum Non-Detect	3.8	Minimum Non-Detect	1.335

	A–E	F	G–K	L
301	Maximum Non-Detect	3.8	Maximum Non-Detect	1.335
302				
303				
304	**UCL Statistics**			
305	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
306	Shapiro Wilk Test Statistic	0.589	Shapiro Wilk Test Statistic	0.947
307	5% Shapiro Wilk Critical Value	0.897	5% Shapiro Wilk Critical Value	0.897
308	**Data not Normal at 5% Significance Level**		**Data appear Lognormal at 5% Significance Level**	
309				
310	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
311	DL/2 Substitution Method		DL/2 Substitution Method	
312	Mean	305.5	Mean	4.372
313	SD	541.3	SD	1.84
314	95% DL/2 (t) UCL	520.9	95% H-Stat (DL/2) UCL	2411
315				
316	Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
317	Mean	287.3	Mean in Log Scale	4.368
318	SD	546.6	SD in Log Scale	1.849
319	95% MLE (t) UCL	504.8	Mean in Original Scale	305.5
320	95% MLE (Tiku) UCL	486.6	SD in Original Scale	541.3
321			95% t UCL	520.9
322			95% Percentile Bootstrap UCL	526.9
323			95% BCA Bootstrap UCL	591.1
324			95% H UCL	2476
325				
326	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
327	k star (bias corrected)	0.476	**Data appear Lognormal at 5% Significance Level**	
328	Theta Star	677.4		
329	nu star	17.13		
330				
331	A-D Test Statistic	1.106	**Nonparametric Statistics**	
332	5% A-D Critical Value	0.798	Kaplan-Meier (KM) Method	
333	K-S Test Statistic	0.798	Mean	305.7
334	5% K-S Critical Value	0.215	SD	526.7
335	**Data not Gamma Distributed at 5% Significance Level**		SE of Mean	124.3
336			95% KM (t) UCL	521.3
337	**Assuming Gamma Distribution**		95% KM (z) UCL	510.2
338	Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	520.9
339	Minimum	0.000001	95% KM (bootstrap t) UCL	667.6
340	Maximum	1860	95% KM (BCA) UCL	527.1
341	Mean	305.4	95% KM (Percentile Bootstrap) UCL	517.5
342	Median	93	95% KM (Chebyshev) UCL	847.7
343	SD	541.3	97.5% KM (Chebyshev) UCL	1082
344	k star	0.307	99% KM (Chebyshev) UCL	1543
345	Theta star	995		
346	Nu star	11.66	**Potential UCLs to Use**	
347	AppChi2	5.007	99% KM (Chebyshev) UCL	1543
348	95% Gamma Approximate UCL	711.6		
349	95% Adjusted Gamma UCL	769.5		
350	**Note: DL/2 is not a recommended method.**			

	A	B	C	D	E	F	G	H	I	J	K	L
351												
352	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
353	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
354	For additional insight, the user may want to consult a statistician.											
355												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Benzo(b)fluoranthene											
10												
11						General Statistics						
12						Number of Valid Data	19			Number of Detected Data		18
13						Number of Distinct Detected Data	18			Number of Non-Detect Data		1
14						Number of Missing Values	1			Percent Non-Detects		5.26%
15												
16						Raw Statistics				Log-transformed Statistics		
17						Minimum Detected	9.5			Minimum Detected		2.251
18						Maximum Detected	4650			Maximum Detected		8.445
19						Mean of Detected	770.8			Mean of Detected		5.318
20						SD of Detected	1361			SD of Detected		1.762
21						Minimum Non-Detect	3.8			Minimum Non-Detect		1.335
22						Maximum Non-Detect	3.8			Maximum Non-Detect		1.335
23												
24												
25						UCL Statistics						
26						Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only		
27						Shapiro Wilk Test Statistic	0.589			Shapiro Wilk Test Statistic		0.947
28						5% Shapiro Wilk Critical Value	0.897			5% Shapiro Wilk Critical Value		0.897
29						Data not Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level		
30												
31						Assuming Normal Distribution				Assuming Lognormal Distribution		
32						DL/2 Substitution Method				DL/2 Substitution Method		
33						Mean	730.3			Mean		5.072
34						SD	1335			SD		2.021
35						95% DL/2 (t) UCL	1261			95% H-Stat (DL/2) UCL		9469
36												
37						Maximum Likelihood Estimate(MLE) Method				Log ROS Method		
38						Mean	685			Mean in Log Scale		5.092
39						SD	1347			SD in Log Scale		1.975
40						95% MLE (t) UCL	1221			Mean in Original Scale		730.3
41						95% MLE (Tiku) UCL	1176			SD in Original Scale		1334
42										95% t UCL		1261
43										95% Percentile Bootstrap UCL		1266
44										95% BCA Bootstrap UCL		1395
45										95% H UCL		8121
46												
47						Gamma Distribution Test with Detected Values Only				Data Distribution Test with Detected Values Only		
48						k star (bias corrected)	0.438			Data appear Lognormal at 5% Significance Level		
49						Theta Star	1761					
50						nu star	15.75					

	A	B	C	D	E	F	G	H	I	J	K	L
51												
52					A-D Test Statistic	1.092			**Nonparametric Statistics**			
53					5% A-D Critical Value	0.804					Kaplan-Meier (KM) Method	
54					K-S Test Statistic	0.804					Mean	730.7
55					5% K-S Critical Value	0.216					SD	1299
56		**Data not Gamma Distributed at 5% Significance Level**									SE of Mean	306.6
57											95% KM (t) UCL	1262
58			**Assuming Gamma Distribution**								95% KM (z) UCL	1235
59					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	1261
60					Minimum	0.000001					95% KM (bootstrap t) UCL	1674
61					Maximum	4650					95% KM (BCA) UCL	1342
62					Mean	730.2					95% KM (Percentile Bootstrap) UCL	1251
63					Median	190					95% KM (Chebyshev) UCL	2067
64					SD	1335					97.5% KM (Chebyshev) UCL	2645
65					k star	0.289					99% KM (Chebyshev) UCL	3781
66					Theta star	2524						
67					Nu star	10.99			**Potential UCLs to Use**			
68					AppChi2	4.57					99% KM (Chebyshev) UCL	3781
69					95% Gamma Approximate UCL	1756						
70					95% Adjusted Gamma UCL	1905						
71	**Note: DL/2 is not a recommended method.**											
72												
73				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
74				**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**								
75				**For additional insight, the user may want to consult a statistician.**								
76												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Full Data Sets								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Lead											
10												
11						General Statistics						
12						Number of Valid Observations	19			Number of Distinct Observations	19	
13						Number of Missing Values	1					
14												
15						Raw Statistics				Log-transformed Statistics		
16						Minimum	18.8			Minimum of Log Data	2.934	
17						Maximum	3697			Maximum of Log Data	8.215	
18						Mean	338.5			Mean of log Data	4.535	
19						Median	60			SD of log Data	1.471	
20						SD	832.5					
21						Std. Error of Mean	191					
22						Coefficient of Variation	2.459					
23						Skewness	4.042					
24												
25						Relevant UCL Statistics						
26						Normal Distribution Test				Lognormal Distribution Test		
27						Shapiro Wilk Test Statistic	0.401			Shapiro Wilk Test Statistic	0.89	
28						Shapiro Wilk Critical Value	0.901			Shapiro Wilk Critical Value	0.901	
29						Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level		
30												
31						Assuming Normal Distribution				Assuming Lognormal Distribution		
32						95% Student's-t UCL	669.7			95% H-UCL	875.6	
33						95% UCLs (Adjusted for Skewness)				95% Chebyshev (MVUE) UCL	679.5	
34						95% Adjusted-CLT UCL (Chen-1995)	841.9			97.5% Chebyshev (MVUE) UCL	866.2	
35						95% Modified-t UCL (Johnson-1978)	699.2			99% Chebyshev (MVUE) UCL	1233	
36												
37						Gamma Distribution Test				Data Distribution		
38						k star (bias corrected)	0.451			Data do not follow a Discernable Distribution (0.05)		
39						Theta Star	751					
40						MLE of Mean	338.5					
41						MLE of Standard Deviation	504.2					
42						nu star	17.13					
43						Approximate Chi Square Value (.05)	8.765			Nonparametric Statistics		
44						Adjusted Level of Significance	0.0369			95% CLT UCL	652.7	
45						Adjusted Chi Square Value	8.245			95% Jackknife UCL	669.7	
46										95% Standard Bootstrap UCL	639.3	
47						Anderson-Darling Test Statistic	1.633			95% Bootstrap-t UCL	1686	
48						Anderson-Darling 5% Critical Value	0.804			95% Hall's Bootstrap UCL	1703	
49						Kolmogorov-Smirnov Test Statistic	0.228			95% Percentile Bootstrap UCL	709.5	
50						Kolmogorov-Smirnov 5% Critical Value	0.21			95% BCA Bootstrap UCL	924.1	

	A	B	C	D	E	F	G	H	I	J	K	L
51	Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL					1171
52							97.5% Chebyshev(Mean, Sd) UCL					1531
53	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					2239
54					95% Approximate Gamma UCL	661.6						
55					95% Adjusted Gamma UCL	703.3						
56												
57	Potential UCL to Use						Use 95% Chebyshev (Mean, Sd) UCL					1171
58												
59	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
60	These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)											
61	and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.											
62												

Surface Soil EPCs Weighted 90 Percent Excavated Area 10 Percent Unexcavated Area
Operable Unit 9 Remedial Investigation
Portsmouth Naval Shipyard, Kittery, Maine

Parameter	Excavated Mean	Unexcavated Mean	Weighted Average	Excavated Standard Deviation	Unexcavated Standard Deviation	Weighted Variance	Weighted Standard Deviation	Excavated Sample Size	Unexcavated Sample Size	T-Statistic	UCL[(1)]
Metals (mg/kg)											
Antimony	0.584615385	0.523333333	0.578487179	0.736550127	0.156673759	0.033843214	0.183965251	13	6	1.734064	0.65167251
Lead	397.0653846	211.6833333	378.5271795	1006.210206	192.1846239	63145.54075	251.2877648	13	6	1.734064	478.494849
Mercury	0.228884615	0.183666667	0.224362821	0.339309234	0.237150304	0.007267266	0.085248258	13	6	1.734064	0.25827641
PAHs (ug/kg)											
2-Methylnaphthalene	38.3	NA	NA	44.47676672	NA	NA	NA	10	0	NA	NA
Acenaphthene	115.3846154	16.21666667	105.4678205	168.188491	9.31416484	1762.665242	41.98410701	13	6	1.734064	122.17
Acenaphthylene	221.7423077	26.66666667	202.2347436	373.9030823	6.501281925	8710.904837	93.33222828	13	6	1.734064	239.364308
Benzo(a)anthracene	1009.453846	124.6666667	920.9751282	1479.810876	69.30127464	136451.8956	369.3939571	13	6	1.734064	1067.92798
Benzo(a)pyrene	888.5307692	118.5	811.5276923	1360.558236	56.8216508	115344.3163	339.6237864	13	6	1.734064	946.637328
Benzo(b)fluoranthene	999.1846154	147.6666667	914.0328205	1555.862976	80.05414834	150839.5101	388.3806253	13	6	1.734064	1068.53897
Benzo(g,h,i)perylene	450.1846154	80.5	413.2161538	664.2038101	36.71920478	27490.32625	165.8020695	13	6	1.734064	479.175778
Benzo(k)fluoranthene	675.4538462	75.83333333	615.4917949	1029.7673	34.66073667	66074.36851	257.0493503	13	6	1.734064	717.751547
Chrysene	1079.146154	120.3333333	983.2648718	1644.046358	57.97470713	168416.3423	410.3856019	13	6	1.734064	1146.52508
Dibenzo(a,h)anthracene	145.8884615	26.83333333	133.9829487	236.699002	14.31665697	3491.218398	59.08653313	13	6	1.734064	157.48884
Fluoranthene	1559.076923	263.3333333	1429.502564	2187.87608	152.9269978	298293.548	546.1625655	13	6	1.734064	1646.77776
Fluorene	207.4615385	19.33333333	188.6487179	325.9494562	10.85664159	6619.955588	81.3631095	13	6	1.734064	221.01671
Indeno(1,2,3-cd)pyrene	413.0153846	72.66666667	378.9805128	631.8765608	36.47282093	24879.68406	157.7329517	13	6	1.734064	441.730068
Naphthalene	55.5	8.4	50.79	67.99806676	5.713492802	288.1487942	16.97494607	13	6	1.734064	57.5429981
Phenanthrene	1227.992308	166.6666667	1121.859744	1857.878073	98.27648074	215084.2399	463.7717541	13	6	1.734064	1306.35811
Pyrene	1318.092308	216.1666667	1207.899744	1863.065004	118.8619648	216294.2455	465.0744515	13	6	1.734064	1392.91635

NA = Not Applicaable UCL = 95% Upper Confidence Limit
NC = Not Calculated

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that

Unexcavated Locations:
OU9-01
OU9-02
OU9-03
OU9-04
OU9-05
OU9-06

Surface Soil EPCs Weighted 95 Percent Soils No Ash/Burnt Material 5 Percent Soils With Ash/Burnt Material
Operable Unit 9 Remedial Investigation
Portsmouth Naval Shipyard, Kittery, Maine

Parameter	Non-Ash/Burnt Mean	Ash/Burnt Mean	Weighted Average	Non-Ash/Burnt Standard Deviation	Ash/Burnt Standard Deviation	Weighted Variance	Weighted Standard Deviation	Non-Ash Sample Size	Ash Sample Size	T-Statistic	UCL[(1)]
Metals (mg/kg)											
Antimony	0.567647059	0.545	0.566514706	0.644265856	0.077781746	0.022043347	0.148470021	17	2	1.734064	0.62557927
Lead	341.1735294	316	339.9148529	881.8617359	176.7766953	41324.72776	203.2848439	17	2	1.734064	420.785929
Mercury	0.221029412	0.16	0.217977941	0.322364238	0.042426407	0.005519111	0.074290716	17	2	1.734064	0.24753238
PAHs (ug/kg)											
2-Methylnaphthalene	38.3	NA	NA	44.47676672	NA	NA	NA	17	0	1.833113	NA
Acenaphthene	92.15882353	15.3	88.31588235	151.9729018	12.30365799	1226.302519	35.01860248	17	2	1.734064	102.247034
Acenaphthylene	175.8617647	26.5	168.3936765	334.8629867	4.949747468	5952.985385	77.15559205	17	2	1.734064	199.087828
Benzo(a)anthracene	800.0529412	135	766.8002941	1339.877993	7.071067812	95307.93981	308.7198403	17	2	1.734064	889.615676
Benzo(a)pyrene	704.8176471	140	676.5767647	1227.107805	14.14213562	79940.1731	282.7369327	17	2	1.734064	789.055588
Benzo(b)fluoranthene	794.4352941	185	763.9635294	1400.726005	7.071067812	104160.9501	322.739756	17	2	1.734064	892.356335
Benzo(g,h,i)perylene	361.7882353	92.5	348.3238235	598.5369923	9.192388155	19018.78176	137.9085993	17	2	1.734064	403.186826
Benzo(k)fluoranthene	534.4647059	75	511.4914706	929.692796	7.071067812	45885.74763	214.2095881	17	2	1.734064	596.708645
Chrysene	849.4647059	155	814.7414706	1486.658286	7.071067812	117333.1775	342.539308	17	2	1.734064	951.010963
Dibenzo(a,h)anthracene	117.15	33	112.9425	211.9626574	2.828427125	2385.167161	48.83817319	17	2	1.734064	132.371374
Fluoranthene	1250.470588	295	1202.697059	1981.39768	49.49747468	208424.1172	456.5349025	17	2	1.734064	1384.31645
Fluorene	163.3529412	18	156.0852941	293.9914143	9.899494937	4588.589201	67.73912607	17	2	1.734064	183.033373
Indeno(1,2,3-cd)pyrene	331.2470588	87	319.0347059	568.2530039	8.485281374	17142.89044	130.9308613	17	2	1.734064	371.121814
Naphthalene	44.82352941	4.95	42.82985294	62.20364518	1.202081528	205.4157686	14.33233298	17	2	1.734064	48.5315628
Phenanthrene	975.5235294	190	936.2473529	1676.750036	70.71067812	149263.329	386.3461259	17	2	1.734064	1089.94414
Pyrene	1056.6	235	1015.52	1686.326598	21.21320344	150967.4389	388.5452855	17	2	1.734064	1170.09166

NA = Not Applicaable UCL = 95% Upper Confidence Limit
NC = Not Calculated

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

ASH/BURNT Material Surface Soil Samples:
OU9-SS-01-0002
OU9-SS-04-0002

Subsurface Soil EPCs

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Mercury											
10												
11						General Statistics						
12						Number of Valid Data	38			Number of Detected Data		34
13						Number of Distinct Detected Data	34			Number of Non-Detect Data		4
14						Number of Missing Values	1			Percent Non-Detects		10.53%
15												
16						Raw Statistics				Log-transformed Statistics		
17						Minimum Detected	0.0025			Minimum Detected		-5.991
18						Maximum Detected	8.2			Maximum Detected		2.104
19						Mean of Detected	0.758			Mean of Detected		-2.368
20						SD of Detected	1.898			SD of Detected		2.189
21						Minimum Non-Detect	0.0048			Minimum Non-Detect		-5.339
22						Maximum Non-Detect	0.025			Maximum Non-Detect		-3.689
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		14
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		24
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		36.84%
27												
28						UCL Statistics						
29						Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.436			Shapiro Wilk Test Statistic		0.965
31						5% Shapiro Wilk Critical Value	0.933			5% Shapiro Wilk Critical Value		0.933
32						Data not Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level		
33												
34						Assuming Normal Distribution				Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	0.679			Mean		-2.63
37						SD	1.808			SD		2.219
38						95% DL/2 (t) UCL	1.173			95% H-Stat (DL/2) UCL		3.738
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41						MLE yields a negative mean				Mean in Log Scale		-2.679
42										SD in Log Scale		2.277
43										Mean in Original Scale		0.678
44										SD in Original Scale		1.808
45										95% t UCL		1.173
46										95% Percentile Bootstrap UCL		1.233
47										95% BCA Bootstrap UCL		1.429
48										95% H-UCL		4.35
49												
50						Gamma Distribution Test with Detected Values Only				Data Distribution Test with Detected Values Only		

	A	B	C	D	E	F	G	H	I	J	K	L
51					k star (bias corrected)	0.316	Data Follow Appr. Gamma Distribution at 5% Significance Level					
52					Theta Star	2.394						
53					nu star	21.51						
54												
55					A-D Test Statistic	1.698	Nonparametric Statistics					
56					5% A-D Critical Value	0.85					Kaplan-Meier (KM) Method	
57					K-S Test Statistic	0.85					Mean	0.679
58					5% K-S Critical Value	0.163					SD	1.784
59	Data follow Appr. Gamma Distribution at 5% Significance Level										SE of Mean	0.294
60											95% KM (t) UCL	1.174
61			Assuming Gamma Distribution								95% KM (z) UCL	1.162
62				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	1.173
63					Minimum	0.000001					95% KM (bootstrap t) UCL	2.058
64					Maximum	8.2					95% KM (BCA) UCL	1.221
65					Mean	0.678					95% KM (Percentile Bootstrap) UCL	1.193
66					Median	0.0625					95% KM (Chebyshev) UCL	1.959
67					SD	1.808					97.5% KM (Chebyshev) UCL	2.513
68					k star	0.226					99% KM (Chebyshev) UCL	3.601
69					Theta star	2.996						
70					Nu star	17.2	Potential UCLs to Use					
71					AppChi2	8.812					95% KM (Chebyshev) UCL	1.959
72					95% Gamma Approximate UCL	1.323						
73					95% Adjusted Gamma UCL	1.361						
74	Note: DL/2 is not a recommended method.											
75												
76	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
77	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
78	For additional insight, the user may want to consult a statistician.											
79												
80												
81	2-Methylnaphthalene											
82												
83					General Statistics							
84					Number of Valid Data	18					Number of Detected Data	4
85					Number of Distinct Detected Data	4					Number of Non-Detect Data	14
86					Number of Missing Values	21					Percent Non-Detects	77.78%
87												
88				Raw Statistics			Log-transformed Statistics					
89					Minimum Detected	16					Minimum Detected	2.773
90					Maximum Detected	560000					Maximum Detected	13.24
91					Mean of Detected	143572					Mean of Detected	7.788
92					SD of Detected	277696					SD of Detected	4.572
93					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
94					Maximum Non-Detect	4					Maximum Non-Detect	1.386
95												
96	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	14
97	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	4
98	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	77.78%
99												
100	Warning: There are only 4 Distinct Detected Values in this data											

	A	B	C	D	E	F	G	H	I	J	K	L
101	Note: It should be noted that even though bootstrap may be performed on this data set											
102	the resulting calculations may not be reliable enough to draw conclusions											
103												
104	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.											
105												
106												
107	UCL Statistics											
108	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
109					Shapiro Wilk Test Statistic	0.648			Shapiro Wilk Test Statistic			0.983
110					5% Shapiro Wilk Critical Value	0.748			5% Shapiro Wilk Critical Value			0.748
111	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
112												
113	Assuming Normal Distribution						Assuming Lognormal Distribution					
114					DL/2 Substitution Method				DL/2 Substitution Method			
115					Mean	31906			Mean			2.201
116					SD	131836			SD			3.624
117					95% DL/2 (t) UCL	85963			95% H-Stat (DL/2) UCL			4202234
118												
119					Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method			
120	MLE yields a negative mean								Mean in Log Scale			-8.863
121									SD in Log Scale			10.66
122									Mean in Original Scale			31905
123									SD in Original Scale			131836
124									95% t UCL			85962
125									95% Percentile Bootstrap UCL			94111
126									95% BCA Bootstrap UCL			126016
127									95% H-UCL			N/A
128												
129	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
130					k star (bias corrected)	0.212	Data appear Gamma Distributed at 5% Significance Level					
131					Theta Star	676180						
132					nu star	1.699						
133												
134					A-D Test Statistic	0.309	Nonparametric Statistics					
135					5% A-D Critical Value	0.74			Kaplan-Meier (KM) Method			
136					K-S Test Statistic	0.74			Mean			31917
137					5% K-S Critical Value	0.425			SD			128119
138	Data appear Gamma Distributed at 5% Significance Level								SE of Mean			34869
139									95% KM (t) UCL			92576
140	Assuming Gamma Distribution								95% KM (z) UCL			89272
141					Gamma ROS Statistics using Extrapolated Data				95% KM (jackknife) UCL			85797
142					Minimum	0.000001			95% KM (bootstrap t) UCL			1364640
143					Maximum	560000			95% KM (BCA) UCL			N/A
144					Mean	31905			95% KM (Percentile Bootstrap) UCL			124471
145					Median	0.000001			95% KM (Chebyshev) UCL			183910
146					SD	131836			97.5% KM (Chebyshev) UCL			249677
147					k star	0.075			99% KM (Chebyshev) UCL			378864
148					Theta star	425582						
149					Nu star	2.699	Potential UCLs to Use					
150					AppChi2	0.289			95% KM (t) UCL			92576

	A	B	C	D	E	F	G	H	I	J	K	L
151					95% Gamma Approximate UCL	297853						
152					95% Adjusted Gamma UCL	N/A						
153	Note: DL/2 is not a recommended method.											
154												
155	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
156	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
157	For additional insight, the user may want to consult a statistician.											
158												
159												
160	Acenaphthylene											
161												
162	General Statistics											
163					Number of Valid Data	38				Number of Detected Data		24
164					Number of Distinct Detected Data	23				Number of Non-Detect Data		14
165					Number of Missing Values	1				Percent Non-Detects		36.84%
166												
167	Raw Statistics						Log-transformed Statistics					
168					Minimum Detected	5.6				Minimum Detected		1.723
169					Maximum Detected	370000				Maximum Detected		12.82
170					Mean of Detected	19861				Mean of Detected		5.176
171					SD of Detected	76323				SD of Detected		3.224
172					Minimum Non-Detect	3.5				Minimum Non-Detect		1.253
173					Maximum Non-Detect	3.8				Maximum Non-Detect		1.335
174												
175	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		14
176	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		24
177	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		36.84%
178												
179	UCL Statistics											
180	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
181					Shapiro Wilk Test Statistic	0.287				Shapiro Wilk Test Statistic		0.878
182					5% Shapiro Wilk Critical Value	0.916				5% Shapiro Wilk Critical Value		0.916
183	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
184												
185	Assuming Normal Distribution						Assuming Lognormal Distribution					
186					DL/2 Substitution Method					DL/2 Substitution Method		
187					Mean	12544				Mean		3.486
188					SD	60953				SD		3.39
189					95% DL/2 (t) UCL	29226				95% H-Stat (DL/2) UCL		273046
190												
191					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
192	MLE yields a negative mean									Mean in Log Scale		2.254
193										SD in Log Scale		4.762
194										Mean in Original Scale		12544
195										SD in Original Scale		60953
196										95% t UCL		29226
197										95% Percentile Bootstrap UCL		30163
198										95% BCA Bootstrap UCL		43435
199										95% H-UCL		458800000
200												

	A	B	C	D	E	F	G	H	I	J	K	L
201	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
202					k star (bias corrected)	0.169	Data do not follow a Discernable Distribution (0.05)					
203					Theta Star	117695						
204					nu star	8.1						
205												
206					A-D Test Statistic	2.963	Nonparametric Statistics					
207					5% A-D Critical Value	0.911					Kaplan-Meier (KM) Method	
208					K-S Test Statistic	0.911					Mean	12546
209					5% K-S Critical Value	0.198					SD	60146
210	Data not Gamma Distributed at 5% Significance Level										SE of Mean	9967
211											95% KM (t) UCL	29361
212	Assuming Gamma Distribution										95% KM (z) UCL	28940
213				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	29227
214					Minimum	0.000001					95% KM (bootstrap t) UCL	420190
215					Maximum	370000					95% KM (BCA) UCL	32198
216					Mean	12544					95% KM (Percentile Bootstrap) UCL	31843
217					Median	11.63					95% KM (Chebyshev) UCL	55990
218					SD	60953					97.5% KM (Chebyshev) UCL	74788
219					k star	0.0863					99% KM (Chebyshev) UCL	111714
220					Theta star	145316						
221					Nu star	6.56	Potential UCLs to Use					
222					AppChi2	1.933					99% KM (Chebyshev) UCL	111714
223					95% Gamma Approximate UCL	42580						
224					95% Adjusted Gamma UCL	44953						
225	Note: DL/2 is not a recommended method.											
226												
227	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
228	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
229	For additional insight, the user may want to consult a statistician.											
230												
231												
232	Benzo(a)anthracene											
233												
234					General Statistics							
235					Number of Valid Data	38					Number of Detected Data	29
236					Number of Distinct Detected Data	29					Number of Non-Detect Data	9
237					Number of Missing Values	1					Percent Non-Detects	23.68%
238												
239					Raw Statistics		Log-transformed Statistics					
240					Minimum Detected	3.1					Minimum Detected	1.131
241					Maximum Detected	410000					Maximum Detected	12.92
242					Mean of Detected	23721					Mean of Detected	5.415
243					SD of Detected	81277					SD of Detected	3.314
244					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
245					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
246												
247	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	10
248	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	28
249	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	26.32%
250												

	A	B	C	D	E	F	G	H	I	J	K	L
251	UCL Statistics											
252	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
253					Shapiro Wilk Test Statistic	0.338					Shapiro Wilk Test Statistic	0.928
254					5% Shapiro Wilk Critical Value	0.926					5% Shapiro Wilk Critical Value	0.926
255	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
256												
257	Assuming Normal Distribution						Assuming Lognormal Distribution					
258					DL/2 Substitution Method						DL/2 Substitution Method	
259					Mean	18103					Mean	4.272
260					SD	71439					SD	3.554
261					95% DL/2 (t) UCL	37655					95% H-Stat (DL/2) UCL	1454346
262												
263					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
264					Mean	344.2					Mean in Log Scale	3.782
265					SD	84736					SD in Log Scale	4.177
266					95% MLE (t) UCL	23535					Mean in Original Scale	18103
267					95% MLE (Tiku) UCL	23871					SD in Original Scale	71439
268											95% t UCL	37654
269											95% Percentile Bootstrap UCL	40034
270											95% BCA Bootstrap UCL	52269
271											95% H UCL	37021339
272												
273	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
274					k star (bias corrected)	0.169	Data appear Lognormal at 5% Significance Level					
275					Theta Star	140279						
276					nu star	9.808						
277												
278					A-D Test Statistic	3.076	Nonparametric Statistics					
279					5% A-D Critical Value	0.916					Kaplan-Meier (KM) Method	
280					K-S Test Statistic	0.916					Mean	18103
281					5% K-S Critical Value	0.181					SD	70493
282	Data not Gamma Distributed at 5% Significance Level										SE of Mean	11638
283											95% KM (t) UCL	37738
284	Assuming Gamma Distribution										95% KM (z) UCL	37246
285					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	37655
286					Minimum	0.000001					95% KM (bootstrap t) UCL	152016
287					Maximum	410000					95% KM (BCA) UCL	40046
288					Mean	18103					95% KM (Percentile Bootstrap) UCL	38635
289					Median	45.75					95% KM (Chebyshev) UCL	68832
290					SD	71439					97.5% KM (Chebyshev) UCL	90782
291					k star	0.102					99% KM (Chebyshev) UCL	133898
292					Theta star	177349						
293					Nu star	7.758	Potential UCLs to Use					
294					AppChi2	2.595					99% KM (Chebyshev) UCL	133898
295					95% Gamma Approximate UCL	54107						
296					95% Adjusted Gamma UCL	56782						
297	Note: DL/2 is not a recommended method.											
298												
299	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
300	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											

	A	B	C	D	E	F	G	H	I	J	K	L
301	For additional insight, the user may want to consult a statistician.											
302												
303												
304	Benzo(a)pyrene											
305												
306	General Statistics											
307					Number of Valid Data	38				Number of Detected Data		29
308					Number of Distinct Detected Data	28				Number of Non-Detect Data		9
309					Number of Missing Values	1				Percent Non-Detects		23.68%
310												
311	Raw Statistics						Log-transformed Statistics					
312					Minimum Detected	2.4				Minimum Detected		0.875
313					Maximum Detected	450000				Maximum Detected		13.02
314					Mean of Detected	25104				Mean of Detected		5.556
315					SD of Detected	87407				SD of Detected		3.393
316					Minimum Non-Detect	3.5				Minimum Non-Detect		1.253
317					Maximum Non-Detect	3.8				Maximum Non-Detect		1.335
318												
319	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		11
320	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		27
321	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		28.95%
322												
323	UCL Statistics											
324	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
325					Shapiro Wilk Test Statistic	0.33				Shapiro Wilk Test Statistic		0.933
326					5% Shapiro Wilk Critical Value	0.926				5% Shapiro Wilk Critical Value		0.926
327	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
328												
329	Assuming Normal Distribution						Assuming Lognormal Distribution					
330					DL/2 Substitution Method					DL/2 Substitution Method		
331					Mean	19159				Mean		4.38
332					SD	76803				SD		3.645
333					95% DL/2 (t) UCL	40178				95% H-Stat (DL/2) UCL		2688424
334												
335					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
336	MLE yields a negative mean									Mean in Log Scale		3.892
337										SD in Log Scale		4.265
338										Mean in Original Scale		19159
339										SD in Original Scale		76803
340										95% t UCL		40178
341										95% Percentile Bootstrap UCL		41761
342										95% BCA Bootstrap UCL		59317
343										95% H-UCL		73654066
344												
345	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
346					k star (bias corrected)	0.171	Data appear Lognormal at 5% Significance Level					
347					Theta Star	146443						
348					nu star	9.943						
349												
350					A-D Test Statistic	2.739	Nonparametric Statistics					

	A	B	C	D	E	F	G	H	I	J	K	L
351					5% A-D Critical Value	0.915					Kaplan-Meier (KM) Method	
352					K-S Test Statistic	0.915					Mean	19159
353					5% K-S Critical Value	0.181					SD	75785
354				Data not Gamma Distributed at 5% Significance Level							SE of Mean	12512
355											95% KM (t) UCL	40267
356				Assuming Gamma Distribution							95% KM (z) UCL	39739
357				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	40178
358					Minimum	0.000001					95% KM (bootstrap t) UCL	163230
359					Maximum	450000					95% KM (BCA) UCL	42255
360					Mean	19158					95% KM (Percentile Bootstrap) UCL	41183
361					Median	39.75					95% KM (Chebyshev) UCL	73696
362					SD	76803					97.5% KM (Chebyshev) UCL	97294
363					k star	0.103					99% KM (Chebyshev) UCL	143648
364					Theta star	186907						
365					Nu star	7.79				Potential UCLs to Use		
366					AppChi2	2.614					99% KM (Chebyshev) UCL	143648
367					95% Gamma Approximate UCL	57093						
368					95% Adjusted Gamma UCL	59907						
369	Note: DL/2 is not a recommended method.											
370												
371	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
372	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
373	For additional insight, the user may want to consult a statistician.											
374												
375												
376	Benzo(b)fluoranthene											
377												
378					General Statistics							
379					Number of Valid Data	38					Number of Detected Data	30
380					Number of Distinct Detected Data	29					Number of Non-Detect Data	8
381					Number of Missing Values	1					Percent Non-Detects	21.05%
382												
383				Raw Statistics						Log-transformed Statistics		
384					Minimum Detected	3.8					Minimum Detected	1.335
385					Maximum Detected	360000					Maximum Detected	12.79
386					Mean of Detected	19774					Mean of Detected	5.394
387					SD of Detected	68673					SD of Detected	3.292
388					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
389					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
390												
391	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	8
392	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	30
393	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	21.05%
394												
395					UCL Statistics							
396				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
397					Shapiro Wilk Test Statistic	0.332					Shapiro Wilk Test Statistic	0.922
398					5% Shapiro Wilk Critical Value	0.927					5% Shapiro Wilk Critical Value	0.927
399				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
400												

	A	B	C	D	E	F	G	H	I	J	K	L
401	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
402					DL/2 Substitution Method						DL/2 Substitution Method	
403					Mean	15611					Mean	4.382
404					SD	61344					SD	3.526
405					95% DL/2 (t) UCL	32400					95% H-Stat (DL/2) UCL	1392863
406												
407					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
408					Mean	4210					Mean in Log Scale	3.799
409					SD	69760					SD in Log Scale	4.309
410					95% MLE (t) UCL	23302					Mean in Original Scale	15611
411					95% MLE (Tiku) UCL	22900					SD in Original Scale	61344
412											95% t UCL	32400
413											95% Percentile Bootstrap UCL	33064
414											95% BCA Bootstrap UCL	43202
415											95% H UCL	89571756
416												
417	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
418					k star (bias corrected)	0.173	**Data do not follow a Discernable Distribution (0.05)**					
419					Theta Star	114005						
420					nu star	10.41						
421												
422					A-D Test Statistic	2.977	**Nonparametric Statistics**					
423					5% A-D Critical Value	0.914					Kaplan-Meier (KM) Method	
424					K-S Test Statistic	0.914					Mean	15612
425					5% K-S Critical Value	0.178					SD	60531
426	**Data not Gamma Distributed at 5% Significance Level**										SE of Mean	9987
427											95% KM (t) UCL	32461
428	**Assuming Gamma Distribution**										95% KM (z) UCL	32039
429					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	32400
430					Minimum	0.000001					95% KM (bootstrap t) UCL	104223
431					Maximum	360000					95% KM (BCA) UCL	34922
432					Mean	15611					95% KM (Percentile Bootstrap) UCL	35536
433					Median	45					95% KM (Chebyshev) UCL	59145
434					SD	61344					97.5% KM (Chebyshev) UCL	77982
435					k star	0.108					99% KM (Chebyshev) UCL	114984
436					Theta star	144777						
437					Nu star	8.195	**Potential UCLs to Use**					
438					AppChi2	2.848					99% KM (Chebyshev) UCL	114984
439					95% Gamma Approximate UCL	44913						
440					95% Adjusted Gamma UCL	47050						
441	**Note: DL/2 is not a recommended method.**											
442												
443	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
444	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
445	**For additional insight, the user may want to consult a statistician.**											
446												
447												
448	**Benzo(g,h,i)perylene**											
449												
450	**General Statistics**											

	A–E	F	G–K	L
451	Number of Valid Data	38	Number of Detected Data	30
452	Number of Distinct Detected Data	28	Number of Non-Detect Data	8
453	Number of Missing Values	1	Percent Non-Detects	21.05%
454				
455	**Raw Statistics**		**Log-transformed Statistics**	
456	Minimum Detected	2.3	Minimum Detected	0.833
457	Maximum Detected	230000	Maximum Detected	12.35
458	Mean of Detected	13929	Mean of Detected	5.214
459	SD of Detected	45015	SD of Detected	3.369
460	Minimum Non-Detect	3.5	Minimum Non-Detect	1.253
461	Maximum Non-Detect	3.8	Maximum Non-Detect	1.335
462				
463	Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	12
464	For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	26
465	Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	31.58%
466				
467	**UCL Statistics**			
468	**Normal Distribution Test with Detected Values Only**		**Lognormal Distribution Test with Detected Values Only**	
469	Shapiro Wilk Test Statistic	0.357	Shapiro Wilk Test Statistic	0.911
470	5% Shapiro Wilk Critical Value	0.927	5% Shapiro Wilk Critical Value	0.927
471	**Data not Normal at 5% Significance Level**		**Data not Lognormal at 5% Significance Level**	
472				
473	**Assuming Normal Distribution**		**Assuming Lognormal Distribution**	
474	DL/2 Substitution Method		DL/2 Substitution Method	
475	Mean	10997	Mean	4.241
476	SD	40266	SD	3.541
477	95% DL/2 (t) UCL	22017	95% H-Stat (DL/2) UCL	1310056
478				
479	Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
480	**MLE yields a negative mean**		Mean in Log Scale	3.824
481			SD in Log Scale	4.072
482			Mean in Original Scale	10997
483			SD in Original Scale	40266
484			95% t UCL	22017
485			95% Percentile Bootstrap UCL	22355
486			95% BCA Bootstrap UCL	31411
487			95% H-UCL	19707436
488				
489	**Gamma Distribution Test with Detected Values Only**		**Data Distribution Test with Detected Values Only**	
490	k star (bias corrected)	0.179	**Data do not follow a Discernable Distribution (0.05)**	
491	Theta Star	77988		
492	nu star	10.72		
493				
494	A-D Test Statistic	2.67	**Nonparametric Statistics**	
495	5% A-D Critical Value	0.911	Kaplan-Meier (KM) Method	
496	K-S Test Statistic	0.911	Mean	10997
497	5% K-S Critical Value	0.178	SD	39733
498	**Data not Gamma Distributed at 5% Significance Level**		SE of Mean	6556
499			95% KM (t) UCL	22057
500	**Assuming Gamma Distribution**		95% KM (z) UCL	21780

	A	B	C	D	E	F	G	H	I	J	K	L
501					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	22017
502					Minimum	0.000001					95% KM (bootstrap t) UCL	70774
503					Maximum	230000					95% KM (BCA) UCL	22938
504					Mean	10996					95% KM (Percentile Bootstrap) UCL	23518
505					Median	27					95% KM (Chebyshev) UCL	39572
506					SD	40266					97.5% KM (Chebyshev) UCL	51937
507					k star	0.11					99% KM (Chebyshev) UCL	76225
508					Theta star	100071						
509					Nu star	8.351				**Potential UCLs to Use**		
510					AppChi2	2.94					99% KM (Chebyshev) UCL	76225
511					95% Gamma Approximate UCL	31235						
512					95% Adjusted Gamma UCL	32701						
513	**Note: DL/2 is not a recommended method.**											
514												
515	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
516	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
517	**For additional insight, the user may want to consult a statistician.**											
518												
519												
520	**Benzo(k)fluoranthene**											
521												
522					**General Statistics**							
523					Number of Valid Data	38					Number of Detected Data	28
524					Number of Distinct Detected Data	28					Number of Non-Detect Data	10
525					Number of Missing Values	1					Percent Non-Detects	26.32%
526												
527					**Raw Statistics**					**Log-transformed Statistics**		
528					Minimum Detected	2.5					Minimum Detected	0.916
529					Maximum Detected	130000					Maximum Detected	11.78
530					Mean of Detected	8687					Mean of Detected	5.161
531					SD of Detected	26566					SD of Detected	3.055
532					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
533					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
534												
535	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	12
536	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	26
537	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	31.58%
538												
539					**UCL Statistics**							
540					**Normal Distribution Test with Detected Values Only**					**Lognormal Distribution Test with Detected Values Only**		
541					Shapiro Wilk Test Statistic	0.383					Shapiro Wilk Test Statistic	0.938
542					5% Shapiro Wilk Critical Value	0.924					5% Shapiro Wilk Critical Value	0.924
543					**Data not Normal at 5% Significance Level**					**Data appear Lognormal at 5% Significance Level**		
544												
545					**Assuming Normal Distribution**					**Assuming Lognormal Distribution**		
546					DL/2 Substitution Method						DL/2 Substitution Method	
547					Mean	6401					Mean	3.958
548					SD	23022					SD	3.312
549					95% DL/2 (t) UCL	12702					95% H-Stat (DL/2) UCL	293563
550												

	A	B	C	D	E	F	G	H	I	J	K	L
551					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
552					**MLE yields a negative mean**						Mean in Log Scale	3.637
553											SD in Log Scale	3.719
554											Mean in Original Scale	6401
555											SD in Original Scale	23022
556											95% t UCL	12702
557											95% Percentile Bootstrap UCL	12535
558											95% BCA Bootstrap UCL	16982
559											95% H-UCL	1948541
560												
561				**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**		
562					k star (bias corrected)	0.193				**Data appear Lognormal at 5% Significance Level**		
563					Theta Star	44941						
564					nu star	10.82						
565												
566					A-D Test Statistic	2.569				**Nonparametric Statistics**		
567					5% A-D Critical Value	0.902					Kaplan-Meier (KM) Method	
568					K-S Test Statistic	0.902					Mean	6402
569					5% K-S Critical Value	0.184					SD	22717
570				**Data not Gamma Distributed at 5% Significance Level**							SE of Mean	3753
571											95% KM (t) UCL	12733
572				**Assuming Gamma Distribution**							95% KM (z) UCL	12574
573					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	12702
574					Minimum	0.000001					95% KM (bootstrap t) UCL	35429
575					Maximum	130000					95% KM (BCA) UCL	13570
576					Mean	6401					95% KM (Percentile Bootstrap) UCL	13175
577					Median	27.5					95% KM (Chebyshev) UCL	22760
578					SD	23022					97.5% KM (Chebyshev) UCL	29838
579					k star	0.105					99% KM (Chebyshev) UCL	43742
580					Theta star	60901						
581					Nu star	7.988				**Potential UCLs to Use**		
582					AppChi2	2.728					99% KM (Chebyshev) UCL	43742
583					95% Gamma Approximate UCL	18743						
584					95% Adjusted Gamma UCL	19650						
585	**Note: DL/2 is not a recommended method.**											
586												
587				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
588				**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**								
589				**For additional insight, the user may want to consult a statistician.**								
590												
591												
592	**Chrysene**											
593												
594						**General Statistics**						
595					Number of Valid Data	38					Number of Detected Data	29
596					Number of Distinct Detected Data	28					Number of Non-Detect Data	9
597					Number of Missing Values	1					Percent Non-Detects	23.68%
598												
599				**Raw Statistics**						**Log-transformed Statistics**		
600					Minimum Detected	3.5					Minimum Detected	1.253

	A	B	C	D	E	F	G	H	I	J	K	L
601					Maximum Detected	420000					Maximum Detected	12.95
602					Mean of Detected	23269					Mean of Detected	5.516
603					SD of Detected	81757					SD of Detected	3.221
604					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
605					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
606												
607	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	10
608	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	28
609	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	26.32%
610												
611					UCL Statistics							
612				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
613					Shapiro Wilk Test Statistic	0.328					Shapiro Wilk Test Statistic	0.925
614					5% Shapiro Wilk Critical Value	0.926					5% Shapiro Wilk Critical Value	0.926
615				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
616												
617				Assuming Normal Distribution						Assuming Lognormal Distribution		
618					DL/2 Substitution Method						DL/2 Substitution Method	
619					Mean	17758					Mean	4.349
620					SD	71825					SD	3.515
621					95% DL/2 (t) UCL	37415					95% H-Stat (DL/2) UCL	1263339
622												
623					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
624				MLE yields a negative mean							Mean in Log Scale	3.772
625											SD in Log Scale	4.27
626											Mean in Original Scale	17758
627											SD in Original Scale	71825
628											95% t UCL	37415
629											95% Percentile Bootstrap UCL	38538
630											95% BCA Bootstrap UCL	54096
631											95% H-UCL	67337050
632												
633				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
634					k star (bias corrected)	0.172				Data do not follow a Discernable Distribution (0.05)		
635					Theta Star	134931						
636					nu star	10						
637												
638					A-D Test Statistic	3.149				Nonparametric Statistics		
639					5% A-D Critical Value	0.914					Kaplan-Meier (KM) Method	
640					K-S Test Statistic	0.914					Mean	17758
641					5% K-S Critical Value	0.181					SD	70874
642				Data not Gamma Distributed at 5% Significance Level							SE of Mean	11701
643											95% KM (t) UCL	37499
644				Assuming Gamma Distribution							95% KM (z) UCL	37004
645					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	37415
646					Minimum	0.000001					95% KM (bootstrap t) UCL	147084
647					Maximum	420000					95% KM (BCA) UCL	37485
648					Mean	17758					95% KM (Percentile Bootstrap) UCL	38047
649					Median	45.5					95% KM (Chebyshev) UCL	68761
650					SD	71825					97.5% KM (Chebyshev) UCL	90829

	A	B	C	D	E	F	G	H	I	J	K	L
651					k star	0.103				99% KM (Chebyshev) UCL		134179
652					Theta star	172586						
653					Nu star	7.82	**Potential UCLs to Use**					
654					AppChi2	2.631				99% KM (Chebyshev) UCL		134179
655				95% Gamma Approximate UCL		52777						
656				95% Adjusted Gamma UCL		55371						
657	**Note: DL/2 is not a recommended method.**											
658												
659	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
660	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
661	**For additional insight, the user may want to consult a statistician.**											
662												
663												
664	**Dibenzo(a,h)anthracene**											
665												
666	**General Statistics**											
667				Number of Valid Data		38				Number of Detected Data		24
668				Number of Distinct Detected Data		24				Number of Non-Detect Data		14
669				Number of Missing Values		1				Percent Non-Detects		36.84%
670												
671	**Raw Statistics**						**Log-transformed Statistics**					
672				Minimum Detected		3.5				Minimum Detected		1.253
673				Maximum Detected		66000				Maximum Detected		11.1
674				Mean of Detected		5308				Mean of Detected		5.012
675				SD of Detected		14581				SD of Detected		3.086
676				Minimum Non-Detect		3.5				Minimum Non-Detect		1.253
677				Maximum Non-Detect		3.8				Maximum Non-Detect		1.335
678												
679	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		16
680	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		22
681	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		42.11%
682												
683	**UCL Statistics**											
684	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					
685				Shapiro Wilk Test Statistic		0.424				Shapiro Wilk Test Statistic		0.907
686				5% Shapiro Wilk Critical Value		0.916				5% Shapiro Wilk Critical Value		0.916
687	**Data not Normal at 5% Significance Level**						**Data not Lognormal at 5% Significance Level**					
688												
689	**Assuming Normal Distribution**						**Assuming Lognormal Distribution**					
690				DL/2 Substitution Method						DL/2 Substitution Method		
691				Mean		3353				Mean		3.383
692				SD		11785				SD		3.255
693				95% DL/2 (t) UCL		6579				95% H-Stat (DL/2) UCL		123167
694												
695				Maximum Likelihood Estimate(MLE) Method		N/A				Log ROS Method		
696	**MLE yields a negative mean**									Mean in Log Scale		2.255
697										SD in Log Scale		4.52
698										Mean in Original Scale		3353
699										SD in Original Scale		11785
700										95% t UCL		6578

	A	B	C	D	E	F	G	H	I	J	K	L
701											95% Percentile Bootstrap UCL	6639
702											95% BCA Bootstrap UCL	8936
703											95% H-UCL	80654379
704												
705			Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only			
706					k star (bias corrected)	0.208			Data do not follow a Discernable Distribution (0.05)			
707					Theta Star	25564						
708					nu star	9.967						
709												
710					A-D Test Statistic	1.817			Nonparametric Statistics			
711					5% A-D Critical Value	0.891					Kaplan-Meier (KM) Method	
712					K-S Test Statistic	0.891					Mean	3354
713					5% K-S Critical Value	0.197					SD	11629
714			Data not Gamma Distributed at 5% Significance Level								SE of Mean	1927
715											95% KM (t) UCL	6605
716			Assuming Gamma Distribution								95% KM (z) UCL	6523
717					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	6579
718					Minimum	0.000001					95% KM (bootstrap t) UCL	16792
719					Maximum	66000					95% KM (BCA) UCL	7059
720					Mean	3352					95% KM (Percentile Bootstrap) UCL	6647
721					Median	9					95% KM (Chebyshev) UCL	11753
722					SD	11785					97.5% KM (Chebyshev) UCL	15388
723					k star	0.0938					99% KM (Chebyshev) UCL	22527
724					Theta star	35757						
725					Nu star	7.126			Potential UCLs to Use			
726					AppChi2	2.24					99% KM (Chebyshev) UCL	22527
727					95% Gamma Approximate UCL	10666						
728					95% Adjusted Gamma UCL	11226						
729	Note: DL/2 is not a recommended method.											
730												
731			Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.									
732			These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).									
733			For additional insight, the user may want to consult a statistician.									
734												
735												
736	Fluoranthene											
737												
738					General Statistics							
739					Number of Valid Data	38					Number of Detected Data	33
740					Number of Distinct Detected Data	33					Number of Non-Detect Data	5
741					Number of Missing Values	1					Percent Non-Detects	13.16%
742												
743			Raw Statistics						Log-transformed Statistics			
744					Minimum Detected	3.1					Minimum Detected	1.131
745					Maximum Detected	550000					Maximum Detected	13.22
746					Mean of Detected	28096					Mean of Detected	5.408
747					SD of Detected	100826					SD of Detected	3.364
748					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
749					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
750												

	A	B	C	D	E	F	G	H	I	J	K	L
751	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	6
752	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	32
753	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	15.79%
754												
755						UCL Statistics						
756					Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only	
757						Shapiro Wilk Test Statistic	0.323				Shapiro Wilk Test Statistic	0.919
758						5% Shapiro Wilk Critical Value	0.931				5% Shapiro Wilk Critical Value	0.931
759					Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level	
760												
761					Assuming Normal Distribution						Assuming Lognormal Distribution	
762						DL/2 Substitution Method					DL/2 Substitution Method	
763						Mean	24400				Mean	4.775
764						SD	94258				SD	3.537
765						95% DL/2 (t) UCL	50197				95% H-Stat (DL/2) UCL	2182513
766												
767						Maximum Likelihood Estimate(MLE) Method					Log ROS Method	
768						Mean	12080				Mean in Log Scale	4.495
769						SD	103101				SD in Log Scale	3.944
770						95% MLE (t) UCL	40297				Mean in Original Scale	24400
771						95% MLE (Tiku) UCL	38828				SD in Original Scale	94259
772											95% t UCL	50197
773											95% Percentile Bootstrap UCL	52480
774											95% BCA Bootstrap UCL	70930
775											95% H UCL	17453348
776												
777					Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only	
778						k star (bias corrected)	0.164				Data do not follow a Discernable Distribution (0.05)	
779						Theta Star	171690					
780						nu star	10.8					
781												
782						A-D Test Statistic	3.596				Nonparametric Statistics	
783						5% A-D Critical Value	0.921				Kaplan-Meier (KM) Method	
784						K-S Test Statistic	0.921				Mean	24400
785						5% K-S Critical Value	0.171				SD	93010
786					Data not Gamma Distributed at 5% Significance Level						SE of Mean	15322
787											95% KM (t) UCL	50250
788					Assuming Gamma Distribution						95% KM (z) UCL	49603
789						Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL	50197
790						Minimum	0.000001				95% KM (bootstrap t) UCL	156450
791						Maximum	550000				95% KM (BCA) UCL	55329
792						Mean	24400				95% KM (Percentile Bootstrap) UCL	52414
793						Median	68.5				95% KM (Chebyshev) UCL	91188
794						SD	94259				97.5% KM (Chebyshev) UCL	120087
795						k star	0.12				99% KM (Chebyshev) UCL	176853
796						Theta star	203797					
797						Nu star	9.099				Potential UCLs to Use	
798						AppChi2	3.387				99% KM (Chebyshev) UCL	176853
799						95% Gamma Approximate UCL	65550					
800						95% Adjusted Gamma UCL	68450					

	A	B	C	D	E	F	G	H	I	J	K	L
801	Note: DL/2 is not a recommended method.											
802												
803	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
804	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
805	For additional insight, the user may want to consult a statistician.											
806												
807												
808	Fluorene											
809												
810	General Statistics											
811	Number of Valid Data					38	Number of Detected Data					23
812	Number of Distinct Detected Data					23	Number of Non-Detect Data					15
813	Number of Missing Values					1	Percent Non-Detects					39.47%
814												
815	Raw Statistics						Log-transformed Statistics					
816	Minimum Detected					2.5	Minimum Detected					0.916
817	Maximum Detected					320000	Maximum Detected					12.68
818	Mean of Detected					18766	Mean of Detected					5.058
819	SD of Detected					67419	SD of Detected					3.465
820	Minimum Non-Detect					3.5	Minimum Non-Detect					1.253
821	Maximum Non-Detect					3.8	Maximum Non-Detect					1.335
822												
823	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect					17
824	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected					21
825	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage					44.74%
826												
827	UCL Statistics											
828	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
829	Shapiro Wilk Test Statistic					0.311	Shapiro Wilk Test Statistic					0.915
830	5% Shapiro Wilk Critical Value					0.914	5% Shapiro Wilk Critical Value					0.914
831	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
832												
833	Assuming Normal Distribution						Assuming Lognormal Distribution					
834	DL/2 Substitution Method						DL/2 Substitution Method					
835	Mean					11359	Mean					3.295
836	SD					52811	SD					3.469
837	95% DL/2 (t) UCL					25812	95% H-Stat (DL/2) UCL					344211
838												
839	Maximum Likelihood Estimate(MLE) Method					N/A	Log ROS Method					
840	MLE yields a negative mean						Mean in Log Scale					2.48
841							SD in Log Scale					4.339
842							Mean in Original Scale					11358
843							SD in Original Scale					52811
844							95% t UCL					25812
845							95% Percentile Bootstrap UCL					27682
846							95% BCA Bootstrap UCL					44056
847							95% H-UCL					29329745
848												
849	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
850	k star (bias corrected)					0.168	Data appear Lognormal at 5% Significance Level					

	A	B	C	D	E	F	G	H	I	J	K	L
851					Theta Star	112011						
852					nu star	7.707						
853												
854					A-D Test Statistic	2.324	**Nonparametric Statistics**					
855					5% A-D Critical Value	0.91					Kaplan-Meier (KM) Method	
856					K-S Test Statistic	0.91					Mean	11359
857					5% K-S Critical Value	0.203					SD	52112
858	**Data not Gamma Distributed at 5% Significance Level**										SE of Mean	8644
859											95% KM (t) UCL	25942
860	**Assuming Gamma Distribution**										95% KM (z) UCL	25577
861					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	25813
862					Minimum	0.000001					95% KM (bootstrap t) UCL	167266
863					Maximum	320000					95% KM (BCA) UCL	27984
864					Mean	11358					95% KM (Percentile Bootstrap) UCL	27699
865					Median	5.25					95% KM (Chebyshev) UCL	49036
866					SD	52811					97.5% KM (Chebyshev) UCL	65339
867					k star	0.0838					99% KM (Chebyshev) UCL	97362
868					Theta star	135500						
869					Nu star	6.371	**Potential UCLs to Use**					
870					AppChi2	1.832					99% KM (Chebyshev) UCL	97362
871					95% Gamma Approximate UCL	39495						
872					95% Adjusted Gamma UCL	41742						
873	**Note: DL/2 is not a recommended method.**											
874												
875	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
876	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
877	**For additional insight, the user may want to consult a statistician.**											
878												
879												
880	**Indeno(1,2,3-cd)pyrene**											
881												
882					**General Statistics**							
883					Number of Valid Data	38					Number of Detected Data	27
884					Number of Distinct Detected Data	26					Number of Non-Detect Data	11
885					Number of Missing Values	1					Percent Non-Detects	28.95%
886												
887					**Raw Statistics**		**Log-transformed Statistics**					
888					Minimum Detected	1.9					Minimum Detected	0.642
889					Maximum Detected	160000					Maximum Detected	11.98
890					Mean of Detected	10502					Mean of Detected	5.315
891					SD of Detected	32670					SD of Detected	3.205
892					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
893					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
894												
895	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	13
896	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	25
897	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	34.21%
898												
899					**UCL Statistics**							
900	**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**					

	A	B	C	D	E	F	G	H	I	J	K	L
901					Shapiro Wilk Test Statistic	0.37					Shapiro Wilk Test Statistic	0.933
902					5% Shapiro Wilk Critical Value	0.923					5% Shapiro Wilk Critical Value	0.923
903				**Data not Normal at 5% Significance Level**						**Data appear Lognormal at 5% Significance Level**		
904												
905				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**		
906					DL/2 Substitution Method						DL/2 Substitution Method	
907					Mean	7462					Mean	3.947
908					SD	27808					SD	3.455
909					95% DL/2 (t) UCL	15073					95% H-Stat (DL/2) UCL	612246
910												
911					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
912				**MLE yields a negative mean**							Mean in Log Scale	3.398
913											SD in Log Scale	4.126
914											Mean in Original Scale	7462
915											SD in Original Scale	27809
916											95% t UCL	15073
917											95% Percentile Bootstrap UCL	15794
918											95% BCA Bootstrap UCL	21329
919											95% H-UCL	18123368
920												
921				**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**		
922					k star (bias corrected)	0.192				**Data appear Lognormal at 5% Significance Level**		
923					Theta Star	54672						
924					nu star	10.37						
925												
926					A-D Test Statistic	2.192				**Nonparametric Statistics**		
927					5% A-D Critical Value	0.901					Kaplan-Meier (KM) Method	
928					K-S Test Statistic	0.901					Mean	7462
929					5% K-S Critical Value	0.187					SD	27440
930				**Data not Gamma Distributed at 5% Significance Level**							SE of Mean	4536
931											95% KM (t) UCL	15115
932				**Assuming Gamma Distribution**							95% KM (z) UCL	14924
933					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	15073
934					Minimum	0.000001					95% KM (bootstrap t) UCL	57493
935					Maximum	160000					95% KM (BCA) UCL	15582
936					Mean	7462					95% KM (Percentile Bootstrap) UCL	15359
937					Median	22.25					95% KM (Chebyshev) UCL	27235
938					SD	27809					97.5% KM (Chebyshev) UCL	35791
939					k star	0.1					99% KM (Chebyshev) UCL	52597
940					Theta star	74286						
941					Nu star	7.634				**Potential UCLs to Use**		
942					AppChi2	2.525					99% KM (Chebyshev) UCL	52597
943					95% Gamma Approximate UCL	22560						
944					95% Adjusted Gamma UCL	23688						
945	**Note: DL/2 is not a recommended method.**											
946												
947				**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**								
948				**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**								
949				**For additional insight, the user may want to consult a statistician.**								
950												

	A	B	C	D	E	F	G	H	I	J	K	L
951												
952	**Naphthalene**											
953												
954						**General Statistics**						
955					Number of Valid Data	38				Number of Detected Data		23
956					Number of Distinct Detected Data	22				Number of Non-Detect Data		15
957					Number of Missing Values	1				Percent Non-Detects		39.47%
958												
959					**Raw Statistics**					**Log-transformed Statistics**		
960					Minimum Detected	2.9				Minimum Detected		1.065
961					Maximum Detected	640000				Maximum Detected		13.37
962					Mean of Detected	31197				Mean of Detected		4.449
963					SD of Detected	133210				SD of Detected		3.475
964					Minimum Non-Detect	3.5				Minimum Non-Detect		1.253
965					Maximum Non-Detect	3.9				Maximum Non-Detect		1.361
966												
967	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		17
968	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		21
969	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		44.74%
970												
971						**UCL Statistics**						
972					**Normal Distribution Test with Detected Values Only**					**Lognormal Distribution Test with Detected Values Only**		
973					Shapiro Wilk Test Statistic	0.251				Shapiro Wilk Test Statistic		0.852
974					5% Shapiro Wilk Critical Value	0.914				5% Shapiro Wilk Critical Value		0.914
975					**Data not Normal at 5% Significance Level**					**Data not Lognormal at 5% Significance Level**		
976												
977					**Assuming Normal Distribution**					**Assuming Lognormal Distribution**		
978					DL/2 Substitution Method					DL/2 Substitution Method		
979					Mean	18883				Mean		2.928
980					SD	103874				SD		3.29
981					95% DL/2 (t) UCL	47312				95% H-Stat (DL/2) UCL		93326
982												
983					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
984					**MLE yields a negative mean**					Mean in Log Scale		1.958
985										SD in Log Scale		4.241
986										Mean in Original Scale		18883
987										SD in Original Scale		103874
988										95% t UCL		47311
989										95% Percentile Bootstrap UCL		52138
990										95% BCA Bootstrap UCL		87804
991										95% H-UCL		9034004
992												
993					**Gamma Distribution Test with Detected Values Only**					**Data Distribution Test with Detected Values Only**		
994					k star (bias corrected)	0.144				**Data do not follow a Discernable Distribution (0.05)**		
995					Theta Star	216218						
996					nu star	6.637						
997												
998					A-D Test Statistic	3.568				**Nonparametric Statistics**		
999					5% A-D Critical Value	0.921				Kaplan-Meier (KM) Method		
1000					K-S Test Statistic	0.921				Mean		18884

	A	B	C	D	E	F	G	H	I	J	K	L
1001					5% K-S Critical Value	0.204					SD	102498
1002		Data not Gamma Distributed at 5% Significance Level									SE of Mean	17001
1003											95% KM (t) UCL	47566
1004			Assuming Gamma Distribution								95% KM (z) UCL	46848
1005				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	47312
1006					Minimum	0.000001					95% KM (bootstrap t) UCL	806406
1007					Maximum	640000					95% KM (BCA) UCL	52240
1008					Mean	18883					95% KM (Percentile Bootstrap) UCL	51275
1009					Median	4.7					95% KM (Chebyshev) UCL	92990
1010					SD	103874					97.5% KM (Chebyshev) UCL	125055
1011					k star	0.0796					99% KM (Chebyshev) UCL	188042
1012					Theta star	237093						
1013					Nu star	6.053			Potential UCLs to Use			
1014					AppChi2	1.667					99% KM (Chebyshev) UCL	188042
1015					95% Gamma Approximate UCL	68566						
1016					95% Adjusted Gamma UCL	72614						
1017	Note: DL/2 is not a recommended method.											
1018												
1019	Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.											
1020	These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).											
1021	For additional insight, the user may want to consult a statistician.											
1022												
1023												
1024	Phenanthrene											
1025												
1026					General Statistics							
1027					Number of Valid Data	38					Number of Detected Data	33
1028					Number of Distinct Detected Data	32					Number of Non-Detect Data	5
1029					Number of Missing Values	1					Percent Non-Detects	13.16%
1030												
1031				Raw Statistics						Log-transformed Statistics		
1032					Minimum Detected	3.5					Minimum Detected	1.253
1033					Maximum Detected	1300000					Maximum Detected	14.08
1034					Mean of Detected	55347					Mean of Detected	5.189
1035					SD of Detected	231041					SD of Detected	3.549
1036					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
1037					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
1038												
1039	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	6
1040	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	32
1041	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	15.79%
1042												
1043					UCL Statistics							
1044				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
1045					Shapiro Wilk Test Statistic	0.269					Shapiro Wilk Test Statistic	0.89
1046					5% Shapiro Wilk Critical Value	0.931					5% Shapiro Wilk Critical Value	0.931
1047				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
1048												
1049				Assuming Normal Distribution						Assuming Lognormal Distribution		
1050					DL/2 Substitution Method						DL/2 Substitution Method	

	A	B	C	D	E	F	G	H	I	J	K	L
1051					Mean	48065					Mean	4.584
1052					SD	215699					SD	3.657
1053					95% DL/2 (t) UCL	107098					95% H-Stat (DL/2) UCL	3519362
1054												
1055				Maximum Likelihood Estimate(MLE) Method							Log ROS Method	
1056					Mean	19496					Mean in Log Scale	4.147
1057					SD	235428					SD in Log Scale	4.289
1058					95% MLE (t) UCL	83929					Mean in Original Scale	48064
1059					95% MLE (Tiku) UCL	80561					SD in Original Scale	215699
1060											95% t UCL	107097
1061											95% Percentile Bootstrap UCL	114066
1062											95% BCA Bootstrap UCL	156241
1063											95% H UCL	111000000
1064												
1065				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
1066					k star (bias corrected)	0.144				Data do not follow a Discernable Distribution (0.05)		
1067					Theta Star	384837						
1068					nu star	9.492						
1069												
1070					A-D Test Statistic	4.432				Nonparametric Statistics		
1071					5% A-D Critical Value	0.933					Kaplan-Meier (KM) Method	
1072					K-S Test Statistic	0.933					Mean	48065
1073					5% K-S Critical Value	0.172					SD	212842
1074				Data not Gamma Distributed at 5% Significance Level							SE of Mean	35063
1075											95% KM (t) UCL	107219
1076				Assuming Gamma Distribution							95% KM (z) UCL	105738
1077					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	107098
1078					Minimum	0.000001					95% KM (bootstrap t) UCL	578115
1079					Maximum	1300000					95% KM (BCA) UCL	112781
1080					Mean	48064					95% KM (Percentile Bootstrap) UCL	111289
1081					Median	43					95% KM (Chebyshev) UCL	200900
1082					SD	215699					97.5% KM (Chebyshev) UCL	267032
1083					k star	0.11					99% KM (Chebyshev) UCL	396936
1084					Theta star	437161						
1085					Nu star	8.356				Potential UCLs to Use		
1086					AppChi2	2.943					99% KM (Chebyshev) UCL	396936
1087					95% Gamma Approximate UCL	136475						
1088					95% Adjusted Gamma UCL	142880						
1089	Note: DL/2 is not a recommended method.											
1090												
1091				Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.								
1092				These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).								
1093				For additional insight, the user may want to consult a statistician.								
1094												
1095												
1096	Pyrene											
1097												
1098					General Statistics							
1099					Number of Valid Data	38					Number of Detected Data	33
1100					Number of Distinct Detected Data	30					Number of Non-Detect Data	5

	A	B	C	D	E	F	G	H	I	J	K	L
1101					Number of Missing Values	1					Percent Non-Detects	13.16%
1102												
1103				Raw Statistics						Log-transformed Statistics		
1104					Minimum Detected	2.9					Minimum Detected	1.065
1105					Maximum Detected	910000					Maximum Detected	13.72
1106					Mean of Detected	44680					Mean of Detected	5.439
1107					SD of Detected	169438					SD of Detected	3.474
1108					Minimum Non-Detect	3.5					Minimum Non-Detect	1.253
1109					Maximum Non-Detect	3.8					Maximum Non-Detect	1.335
1110												
1111	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	6
1112	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	32
1113	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	15.79%
1114												
1115					UCL Statistics							
1116				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
1117					Shapiro Wilk Test Statistic	0.303					Shapiro Wilk Test Statistic	0.915
1118					5% Shapiro Wilk Critical Value	0.931					5% Shapiro Wilk Critical Value	0.931
1119				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
1120												
1121				Assuming Normal Distribution						Assuming Lognormal Distribution		
1122					DL/2 Substitution Method						DL/2 Substitution Method	
1123					Mean	38801					Mean	4.801
1124					SD	158315					SD	3.632
1125					95% DL/2 (t) UCL	82130					95% H-Stat (DL/2) UCL	3810814
1126												
1127					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
1128					Mean	18005					Mean in Log Scale	4.498
1129					SD	173026					SD in Log Scale	4.07
1130					95% MLE (t) UCL	65359					Mean in Original Scale	38801
1131					95% MLE (Tiku) UCL	62887					SD in Original Scale	158316
1132											95% t UCL	82129
1133											95% Percentile Bootstrap UCL	84563
1134											95% BCA Bootstrap UCL	118669
1135											95% H UCL	38221289
1136												
1137				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
1138					k star (bias corrected)	0.153				Data do not follow a Discernable Distribution (0.05)		
1139					Theta Star	291455						
1140					nu star	10.12						
1141												
1142					A-D Test Statistic	3.92				Nonparametric Statistics		
1143					5% A-D Critical Value	0.927					Kaplan-Meier (KM) Method	
1144					K-S Test Statistic	0.927					Mean	38801
1145					5% K-S Critical Value	0.172					SD	156218
1146				Data not Gamma Distributed at 5% Significance Level							SE of Mean	25735
1147											95% KM (t) UCL	82219
1148				Assuming Gamma Distribution							95% KM (z) UCL	81132
1149					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	82129
1150					Minimum	0.000001					95% KM (bootstrap t) UCL	398358

	A	B	C	D	E	F	G	H	I	J	K	L
1151					Maximum	910000					95% KM (BCA) UCL	85101
1152					Mean	38801					95% KM (Percentile Bootstrap) UCL	86215
1153					Median	79.5					95% KM (Chebyshev) UCL	150977
1154					SD	158316					97.5% KM (Chebyshev) UCL	199516
1155					k star	0.115					99% KM (Chebyshev) UCL	294861
1156					Theta star	338736						
1157					Nu star	8.706			**Potential UCLs to Use**			
1158					AppChi2	3.15					99% KM (Chebyshev) UCL	294861
1159					95% Gamma Approximate UCL	107230						
1160					95% Adjusted Gamma UCL	112121						
1161	**Note: DL/2 is not a recommended method.**											
1162												
1163	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
1164	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
1165	**For additional insight, the user may want to consult a statistician.**											
1166												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Antimony											
10												
11						General Statistics						
12						Number of Valid Data	38			Number of Detected Data		16
13						Number of Distinct Detected Data	16			Number of Non-Detect Data		22
14						Number of Missing Values	1			Percent Non-Detects		57.89%
15												
16						Raw Statistics				Log-transformed Statistics		
17						Minimum Detected	0.22			Minimum Detected		-1.514
18						Maximum Detected	3.7			Maximum Detected		1.308
19						Mean of Detected	1.033			Mean of Detected		-0.321
20						SD of Detected	1.005			SD of Detected		0.847
21						Minimum Non-Detect	0.29			Minimum Non-Detect		-1.238
22						Maximum Non-Detect	1.1			Maximum Non-Detect		0.0953
23												
24				Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect		34
25				For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected		4
26				Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage		89.47%
27												
28						UCL Statistics						
29						Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.747			Shapiro Wilk Test Statistic		0.948
31						5% Shapiro Wilk Critical Value	0.887			5% Shapiro Wilk Critical Value		0.887
32						Data not Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level		
33												
34						Assuming Normal Distribution				Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	0.574			Mean		-1.001
37						SD	0.757			SD		0.844
38						95% DL/2 (t) UCL	0.782			95% H-Stat (DL/2) UCL		0.715
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41						MLE yields a negative mean				Mean in Log Scale		-0.978
42										SD in Log Scale		0.801
43										Mean in Original Scale		0.573
44										SD in Original Scale		0.754
45										95% t UCL		0.78
46										95% Percentile Bootstrap UCL		0.798
47										95% BCA Bootstrap UCL		0.854
48										95% H-UCL		0.69
49												
50						Gamma Distribution Test with Detected Values Only				Data Distribution Test with Detected Values Only		

	A	B	C	D	E	F	G	H	I	J	K	L
51					k star (bias corrected)	1.307	**Data appear Gamma Distributed at 5% Significance Level**					
52					Theta Star	0.791						
53					nu star	41.81						
54												
55					A-D Test Statistic	0.573	**Nonparametric Statistics**					
56					5% A-D Critical Value	0.754					Kaplan-Meier (KM) Method	
57					K-S Test Statistic	0.754					Mean	0.587
58					5% K-S Critical Value	0.219					SD	0.74
59	**Data appear Gamma Distributed at 5% Significance Level**										SE of Mean	0.125
60											95% KM (t) UCL	0.797
61			**Assuming Gamma Distribution**								95% KM (z) UCL	0.792
62			Gamma ROS Statistics using Extrapolated Data								95% KM (jackknife) UCL	0.794
63					Minimum	0.000001					95% KM (bootstrap t) UCL	0.959
64					Maximum	3.7					95% KM (BCA) UCL	0.814
65					Mean	0.504					95% KM (Percentile Bootstrap) UCL	0.803
66					Median	0.21					95% KM (Chebyshev) UCL	1.13
67					SD	0.793					97.5% KM (Chebyshev) UCL	1.365
68					k star	0.218					99% KM (Chebyshev) UCL	1.827
69					Theta star	2.307						
70					Nu star	16.6	**Potential UCLs to Use**					
71					AppChi2	8.385					95% KM (t) UCL	0.797
72					95% Gamma Approximate UCL	0.997						
73					95% Adjusted Gamma UCL	1.027						
74	**Note: DL/2 is not a recommended method.**											
75												
76	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
77	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
78	**For additional insight, the user may want to consult a statistician.**											
79												

Subsurface Soil EPCs Weighted 90 Percent Excavated Area 10 Percent Unexcavated Area
Operable Unit 9 Remedial Investigation
Portsmouth Naval Shipyard, Kittery, Maine

Parameter	Excavated Mean	Unexcavated Mean	Weighted Average	Excavated Standard Deviation	Ash/Burnt Standard Deviation	Weighted Variance	Weighted Standard Deviation	Non-Ash Sample Size	Ash Sample Size	T-Statistic	UCL[(1)]
Metals (mg/kg)											
Antimony	0.591532258	0.498571429	0.582236175	0.823340927	0.366852767	0.017904876	0.133809101	31	7	1.687094	0.61885741
Lead	193.6548387	69.54285714	181.2436406	319.0250179	57.22079625	2664.010981	51.61405798	31	7	1.687094	195.369517
Mercury	0.796851613	0.155914286	0.73275788	1.986936052	0.134830702	0.103181166	0.321218252	31	7	1.687094	0.82066977
PAHs (ug/kg)											
2-Methylnaphthalene	31906.20278	NA	NA	131835.8983	NA	NA	NA	18	0	NA	NA
Acenaphthene	4826.301613	8.921428571	4344.563594	18304.28252	11.51009909	8754447.75	2958.791603	31	7	1.687094	5154.33374
Acenaphthylene	15375.06613	8.178571429	13838.37737	67359.08194	7.88388954	118553845.1	10888.24344	31	7	1.687094	16818.3015
Benzo(a)anthracene	22177.03226	61.70714286	19965.49975	78748.00548	89.57388211	162032630.1	12729.20383	31	7	1.687094	23449.2629
Benzo(a)pyrene	23472.6129	55.45	21130.89661	84679.39075	82.29966079	187360828	13687.98115	31	7	1.687094	24877.0606
Benzo(b)fluoranthene	19121.73065	64.97857143	17216.05544	67616.26117	96.5580044	119460871.6	10929.81572	31	7	1.687094	20207.3572
Benzo(g,h,i)perylene	13470.875	40.25	12127.8125	44332.00751	60.89280883	51352094.99	7166.037608	31	7	1.687094	14089.0332
Benzo(k)fluoranthene	7837.122581	42.90714286	7057.701037	25340.1088	64.03509733	16778009.16	4096.09682	31	7	1.687094	8178.73197
Chrysene	21755.25806	55.82142857	19585.3144	79201.89394	78.25635148	163905860.4	12802.57242	31	7	1.687094	23089.1573
Dibenzo(a,h)anthracene	4107.459677	12.48571429	3697.962281	12965.49657	18.31576539	4392397.967	2095.804849	31	7	1.687094	4271.54786
Fluoranthene	29879.11129	134.1	26904.61016	103871.6738	197.7205098	281914666.6	16790.31467	31	7	1.687094	31499.8292
Fluorene	13921.39355	10.25	12530.27919	58335.0214	13.00621646	88916436.53	9429.551237	31	7	1.687094	15110.9845
Indeno(1,2,3-cd)pyrene	9139.654839	33.80714286	8229.070069	30626.23483	50.19414332	24508154.26	4950.571104	31	7	1.687094	9583.95586
Naphthalene	23146.1371	5.435714286	20832.06696	114914.9476	5.470352996	345045503.2	18575.40049	31	7	1.687094	25915.8332
Phenanthrene	58898.87581	84.41428571	53017.42965	238167.2709	118.3762001	1482134073	38498.49443	31	7	1.687094	63553.8025
Pyrene	47538.38226	108.6714286	42795.41118	174596.1048	158.0200906	796512224.4	28222.54816	31	7	1.687094	50519.435

NA = Not Applicaable UCL = 95% Upper Confidence Limit
NC = Not Calculated

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as

Unexcavated Locations:
OU9-01
OU9-02
OU9-03
OU9-04
OU9-05
OU9-06

Subsurface Soil EPCs Weighted 95 Percent Soils No Ash/Burnt Material 5 Percent Soils With Ash/Burnt Material
Operable Unit 9 Remedial Investigation
Portsmouth Naval Shipyard, Kittery, Maine

Parameter	Non-Ash/Burnt Mean	Ash/Burnt Mean	Weighted Average	Non-Ash/Burnt Standard Deviation	Ash/Burnt Standard Deviation	Weighted Variance	Weighted Standard Deviation	Non-Ash Sample Size	Ash Sample Size	T-Statistic	UCL[1]
Metals (mg/kg)											
Antimony	0.414396552	1.09	0.448176724	0.384968491	1.31856456	0.005095057	0.071379669	29	9	1.687094	0.46771211
Lead	135.5689655	284.2888889	143.0049617	292.0972677	278.3931592	2676.77111	51.7375213	29	9	1.687094	157.164627
Mercury	0.111475862	2.506777778	0.231240958	0.170965125	3.175425711	0.003710554	0.060914313	29	9	1.687094	0.24791215
PAHs (ug/kg)											
2-Methylnaphthalene	19.478125	287000	14368.50422	66.89928741	386080.3025	41405139.28	6434.682531	16	2	1.739607	17006.9122
Acenaphthene	51.36551724	16465.35556	872.0650192	164.8340866	32273.60421	290174.8712	538.6788201	29	9	1.687094	1019.49211
Acenaphthylene	74.41551724	52725.13889	2706.951686	210.4355076	121667.9333	4113346.451	2028.138667	29	9	1.687094	3262.0182
Benzo(a)anthracene	263.7051724	75585.83333	4029.81158	798.8052935	136859.9295	5222813.435	2285.347552	29	9	1.687094	4655.27173
Benzo(a)pyrene	304.7465517	79911.27778	4285.073113	868.5064037	147775.9217	6089508.621	2467.692975	29	9	1.687094	4960.43805
Benzo(b)fluoranthene	301.0172414	64944.33333	3533.183046	929.9418463	117530.2977	3863960.384	1965.695903	29	9	1.687094	4071.16006
Benzo(g,h,i)perylene	254.7887931	45610	2522.549353	718.9223942	75702.07697	1607974.837	1268.059477	29	9	1.687094	2869.59533
Benzo(k)fluoranthene	147.8672414	26551.44444	1468.046102	451.978471	43035.65273	520820.6441	721.6790451	29	9	1.687094	1665.55719
Chrysene	300.25	74010.72222	3985.773611	995.1393172	138533.2368	5361779.364	2315.551633	29	9	1.687094	4619.50009
Dibenzo(a,h)anthracene	82.45689655	13891.93333	772.9307184	223.3297429	21873.69455	134457.3235	366.6842286	29	9	1.687094	873.285857
Fluoranthene	476.9189655	101484.5	5527.298017	1492.499708	179789.7374	9048309.083	3008.040738	29	9	1.687094	6350.5468
Fluorene	73.36206897	47723.05	2455.846466	215.3247057	104641.259	3043052.095	1744.434606	29	9	1.687094	2933.26808
Indeno(1,2,3-cd)pyrene	176.0844828	30939.94444	1714.277481	492.1508264	52565.84008	775084.3578	880.3887538	29	9	1.687094	1955.22467
Naphthalene	53.05344828	79558.86111	4028.343831	206.5459824	210892.0405	12355620.07	3515.056198	29	9	1.687094	4990.35399
Phenanthrene	424.2431034	201572.5556	10481.65873	1374.223615	424780.7454	50180627.15	7083.828566	29	9	1.687094	12420.3802
Pyrene	426.8465517	162452.4444	8528.126446	1246.563597	305574.2738	25986035.98	5097.650045	29	9	1.687094	9923.2652

NA = Not Applicaable UCL = 95% Upper Confidence Limit
NC = Not Calculated

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as

ASH/BURNT Material Subsurface Soil Samples:

OU9-SB-22-0205 OU9-SB-14-0810
OU9-SB-14-0608 OU9-SB-13-0608
OU9-SB-13-0406 OU9-SB-22-0508
OU9-SB-04-0508-AVG OU9-SB-15-0608
OU9-SB-15-0406

C.3 Additional Risk Estimates

Appendix C.3 Contents

The contents of Appendix C.3 are separated into three parts as follows:

Risks Including Background. This sub-appendix presents total risks (i.e., including chemicals within background levels) using unweighted EPCs for both surface and subsurface soil for all receptors. RAGS Part D Tables 3.1B and 3.2B present unweighted EPCs for surface and subsurface soil, respectively for all COPCs and chemicals eliminated from COPC selection due to the background screen. RAGS Part D Tables 7 and 9 using these unweighted EPCs are included for both the RME and CTE evaluations. Lead model output files are also presented, as lead was eliminated from COPC selection due to the background screen.

Subsurface Soil Risks. This sub-appendix presents site-specific risks (i.e., excluding chemicals within background levels) for subsurface soil as well as surface soil. The site-specific subsurface soil risks are presented using the three different sets of EPCs. Table 3.1A presents unweighted EPCs for subsurface soil COPCs. Table 3.2A presents EPCs weighted 90% for the excavated area and 10% for the unexcavated area. Table 3.3A presents EPCs weighted 95% for samples without ash/burnt material and 5% for samples with ash/burnt material. RAGS Part D Tables 7 and 9 for all receptors and for both the RME and CTE evaluations are presented for each of the three sets of EPCs.

Vapor Intrusion Analysis. Information used to provide an estimate of potential vapor intrusion risks for Building 62 Annex as described in Section 6.6.2 are provided. The excavation cross-section figures were used to estimate the amount of ash potentially present underneath Building 62 Annex based on the depth of visible ash excavated from the former location of Building 62. A table presenting naphthalene concentrations in ash is provided as well as the Johnson and Ettinger model files.

RISKS INCLUDING BACKGROUND

TABLE 3.1B.RME
UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Benzo(a)anthracene	mg/kg	0.73	2.0 (NP)	7.5 (J)	2.0	mg/kg	95% KM (Chebyshev) UCL	(1)
	Benzo(a)pyrene	mg/kg	0.65	3.3 (L)	7.4 (J)	3.3	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(b)fluoranthene	mg/kg	0.73	3.8 (L)	8.5 (J)	3.8	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(k)fluoranthene	mg/kg	0.49	2.5 (L)	4.8 (J)	2.5	mg/kg	99% KM (Chebyshev) UCL	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.11	0.31 (NP)	1.6 (J)	0.3	mg/kg	95% KM (Chebyshev) UCL	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	0.31	1.5 (L)	3.5 (J)	1.5	mg/kg	99% KM (Chebyshev) UCL	(1)

L = Lognormal
NP = Non-parametric

(1) ProUCL Version 4.1.00 recommended value.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2B.RME
UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
OU9	Antimony	mg/kg	0.57	0.80 (G)	3.7	0.80	mg/kg	95% KM (t) UCL	(1)
	Mercury	mg/kg	0.68	2.0 (G)	8.2	2.0	mg/kg	95% KM (Chebyshev) UCL	(1)
	2-Methylnaphthalene	mg/kg	32	93 (G)	560 (J)	93	mg/kg	95% KM (t) UCL	(1)
	Acenaphthylene	mg/kg	13	110 (NP)	370	110	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(a)anthracene	mg/kg	18	130 (L)	410 (J)	130	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(a)pyrene	mg/kg	19	140 (L)	450	140	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(b)fluoranthene	mg/kg	16	110 (NP)	360	110	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(g,h,i)perylene	mg/kg	11	76 (NP)	230	76	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(k)fluoranthene	mg/kg	6.4	44 (L)	130 (J)	44	mg/kg	99% KM (Chebyshev) UCL	(1)
	Chrysene	mg/kg	72	130 (NP)	420	130	mg/kg	99% KM (Chebyshev) UCL	(1)
	Dibenzo(a,h)anthracene	mg/kg	3.4	23 (NP)	66	23	mg/kg	99% KM (Chebyshev) UCL	(1)
	Fluoranthene	mg/kg	24	180 (NP)	550	180	mg/kg	99% KM (Chebyshev) UCL	(1)
	Fluorene	mg/kg	11	97 (L)	320	97	mg/kg	99% KM (Chebyshev) UCL	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	7.5	53 (L)	160	53	mg/kg	99% KM (Chebyshev) UCL	(1)
	Naphthalene	mg/kg	19	190 (NP)	640	190	mg/kg	99% KM (Chebyshev) UCL	(1)
	Phenanthrene	mg/kg	48	400 (NP)	1300	400	mg/kg	99% KM (Chebyshev) UCL	(1)
	Pyrene	mg/kg	39	290 (NP)	910 (J)	290	mg/kg	99% KM (Chebyshev) UCL	(1)

G = Gamma
L = Lognormal
NP = Non-parametric

(1) ProUCL Version 4.1.00 recommended value.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.

REASONABLE MAXIMUM EXPOSURES

7.1.RME Construction Workers - Entire Site Surface/Subsurface Soil Including Background
7.2.RME Occupational Workers - Entire Site Surface/Subsurface Soil Including Background
7.3.RME Child Recreational Users - Entire Site Surface/Subsurface Soil Including Background
7.4.RME Adult Recreational Users - Entire Site Surface/Subsurface Soil Including Background
7.5.RME Child Residents - Entire Site Surface/Subsurface Soil Including Background
7.6.RME Adult Residents - Entire Site Surface/Subsurface Soil Including Background

CENTRAL TENDENCY EXPOSURES

7.1.CTE Construction Workers - Entire Site Surface/Subsurface Soil Including Background
7.2.CTE Occupational Workers - Entire Site Surface/Subsurface Soil Including Background
7.3.CTE Child Recreational Users - Entire Site Surface/Subsurface Soil Including Background
7.4.CTE Adult Recreational Users - Entire Site Surface/Subsurface Soil Including Background
7.5.CTE Child Residents - Entire Site Surface/Subsurface Soil Including Background
7.6.CTE Adult Residents - Entire Site Surface/Subsurface Soil Including Background

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	5.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-08	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	9.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-07	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.7E-08	7.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	6.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-09	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	8.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-08	5.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	4.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.8E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-07	2.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	4.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-09	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-07					--
		Exposure Point Total									1.2E-06					--
	Exposure Medium Total										1.2E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-10	1.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.3E-6	mg/m^3	4.5E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.0E-09	3.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.7E-6	mg/m^3	5.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-10	3.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.7E-6	mg/m^3	3.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.8E-10	2.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.1E-7	mg/m^3	4.1E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.9E-10	2.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-6	mg/m^3	2.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-10	1.4E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.9E-09					--
		Exposure Point Total									6.9E-09					--
	Exposure Medium Total										6.9E-09					--
Medium Total											1.2E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	2.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.004
				Mercury	2.00	mg/kg	5.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	93.0	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.05
				Acenaphthylene	110	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.004
				Benzo(a)anthracene	130	mg/kg	3.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-06	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	3.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-05	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-06	2.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
				Benzo(k)fluoranthene	44.0	mg/kg	1.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.9E-08	8.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	3.6E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	6.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-06	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	5.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.009
				Fluorene	97.0	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.005
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-06	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	5.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				Phenanthrene	400	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.03
				Pyrene	290	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
			Exp. Route Total								3.9E-05					0.1

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	7.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-07	8.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	4.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-08	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	5.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-07	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.007
				Phenanthrene	400	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.007
			Exp. Route Total								1.5E-05					0.05
		Exposure Point Total									5.4E-05					0.2
	Exposure Medium Total										5.4E-05					0.2
	Air	OU9	Inhalation	Antimony	5.6E-7	mg/m^3	1.1E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.7E-08	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	3.5E-05	(mg/m^3)	0.005
				2-Methylnaphthalene	7.2E-03	mg/m^3	1.4E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	4.2E-3	mg/m^3	8.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	9.1E-5	mg/m^3	1.8E-07	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.0E-08	1.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	9.8E-5	mg/m^3	1.9E-07	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-07	1.3E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	7.7E-5	mg/m^3	1.5E-07	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-08	1.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	5.3E-5	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	3.1E-5	mg/m^3	6.0E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-09	4.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	9.1E-5	mg/m^3	1.8E-07	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.0E-09	1.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.8E-08	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.3E-4	mg/m^3	2.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	1.5E-3	mg/m^3	3.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.7E-5	mg/m^3	7.3E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.0E-09	5.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	1.8E-02	mg/m^3	3.6E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.2E-06	2.5E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.8
				Phenanthrene	2.1E-3	mg/m^3	4.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	2.0E-4	mg/m^3	4.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-05	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-06					0.8
		Exposure Point Total									1.5E-06					0.8
	Exposure Medium Total										1.5E-06					0.8
Medium Total											5.6E-05					1.0
										Total of Receptor Risks Across All Media	5.7E-05				Total of Receptor Hazards Across All Media	1.0

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	7.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-06	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-07	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	8.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.4E-08	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	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)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	5.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	6.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	9.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.2E-06	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	1.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.3E-07	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	7.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.5E-08	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	9.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-07	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	4.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
		Exp. Route Total									9.5E-06					--
		Exposure Point Total									2.1E-05					--
	Exposure Medium Total										2.1E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	2.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.2E-11	8.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	3.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.6E-12	9.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	2.6E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.1E-12	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	3.7E-11	(mg/m^3)	NA	(mg/m^3)	--
		Exp. Route Total									4.4E-11					--
		Exposure Point Total									4.4E-11					--
	Exposure Medium Total										4.4E-11					--
Medium Total											2.1E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-07	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.002
				Mercury	2.00	mg/kg	7.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				2-Methylnaphthalene	93.0	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	110	mg/kg	3.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.002
				Benzo(a)anthracene	130	mg/kg	4.5E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-05	1.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	4.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-04	1.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.8E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	1.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-06	4.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	4.5E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	8.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.9E-05	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	6.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Fluorene	97.0	mg/kg	3.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-05	5.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	6.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.009
				Phenanthrene	400	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.009
			Exp. Route Total								4.9E-04					0.07

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	2.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	110	mg/kg	3.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.002
				Benzo(a)anthracene	130	mg/kg	3.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	4.2E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.1E-04	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-05	9.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	1.3E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.6E-07	3.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	3.9E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.8E-07	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	6.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-05	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	5.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Fluorene	97.0	mg/kg	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.6E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-05	4.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	5.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.008
				Phenanthrene	400	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	8.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.008
			Exp. Route Total								4.2E-04					0.05
		Exposure Point Total									9.1E-04					0.1
	Exposure Medium Total										9.1E-04					0.1
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	7.0E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-11	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	6.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	1.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-10	3.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	1.2E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-09	3.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	9.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	2.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	6.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	3.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-11	1.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	1.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.2E-11	3.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.4E-10	5.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	4.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.1E-11	1.3E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.8E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	9.7E-06	8.0E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.3
				Phenanthrene	3.5E-4	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.5E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-06					0.3
		Exposure Point Total									9.7E-06					0.3
	Exposure Medium Total										9.7E-06					0.3
Medium Total											9.2E-04					0.4
										Total of Receptor Risks Across All Media	9.4E-04				Total of Receptor Hazards Across All Media	0.4

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-05	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	3.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-06	6.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-07	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.1E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	2.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-06	5.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	9.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-05					--
		Exposure Point Total									4.6E-05					--
	Exposure Medium Total										4.6E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	4.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.9E-13	9.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	7.4E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.1E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	8.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.3E-13	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	5.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-13	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	6.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.0E-13	1.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	3.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-13	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-11					--
		Exposure Point Total									1.1E-11					--
	Exposure Medium Total										1.1E-11					--
Medium Total											4.6E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.004
				Mercury	2.00	mg/kg	3.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	93.0	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.04
				Acenaphthylene	110	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.003
				Benzo(a)anthracene	130	mg/kg	1.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-05	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.2E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.5E-04	2.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	9.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-05	2.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
				Benzo(k)fluoranthene	44.0	mg/kg	3.7E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-06	8.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.1E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.9E-07	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.008
				Fluorene	97.0	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	4.4E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-05	9.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				Phenanthrene	400	mg/kg	6.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
				Pyrene	290	mg/kg	4.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
			Exp. Route Total								1.2E-03					0.1

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	8.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	110	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.002
				Benzo(a)anthracene	130	mg/kg	7.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-05	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	8.5E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-04	1.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-05	1.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
				Benzo(k)fluoranthene	44.0	mg/kg	2.7E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-06	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.9E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.8E-07	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.4E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-04	3.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.006
				Fluorene	97.0	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-05	7.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.01
				Phenanthrene	400	mg/kg	4.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
				Pyrene	290	mg/kg	3.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
			Exp. Route Total								8.6E-04					0.08
		Exposure Point Total									2.0E-03					0.2
	Exposure Medium Total										2.0E-03					0.2
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	3.3E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-12	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	8.4E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	5.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	3.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	2.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-11	6.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	3.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.4E-10	6.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	2.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-11	5.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	3.2E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	9.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	2.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	2.9E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.2E-12	6.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	5.1E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.1E-11	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	7.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	1.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	1.4E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	4.6E-07	1.6E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.05
				Phenanthrene	3.5E-4	mg/m^3	1.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	1.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.6E-07					0.05
		Exposure Point Total									4.6E-07					0.05
	Exposure Medium Total										4.6E-07					0.05
Medium Total											2.0E-03					0.3
										Total of Receptor Risks Across All Media	2.1E-03				Total of Receptor Hazards Across All Media	0.3

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3	mg/kg	2.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.8	mg/kg	2.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	3.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5	mg/kg	1.6E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.3	mg/kg	1.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-07	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5	mg/kg	9.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-06					--
			Dermal	Benzo(a)anthracene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-06	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.8	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5	mg/kg	1.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.3	mg/kg	2.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.3E-08	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-06					--
		Exposure Point Total									4.1E-06					--
	Exposure Medium Total										4.1E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	3.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-13	5.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	5.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.8E-12	8.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	6.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-13	9.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	4.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-13	6.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	4.8E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.7E-13	7.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	2.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-13	3.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.1E-12					--
		Exposure Point Total									8.1E-12					--
	Exposure Medium Total										8.1E-12					--
Medium Total											4.1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.8	mg/kg	2.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-08	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.0002
				Mercury	2	mg/kg	7.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				2-Methylnaphthalene	93	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	8.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.1E-06	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.5E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44	mg/kg	2.8E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-07	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	8.3E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.1E-08	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	6.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Fluorene	97	mg/kg	3.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	53	mg/kg	3.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.5E-06	5.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	6.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0010
				Phenanthrene	400	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	290	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0010
			Exp. Route Total								9.0E-05					0.008

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.8	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.6E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	4.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	8.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.3E-06	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-05	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.3E-06	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44	mg/kg	2.9E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-07	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	8.6E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.3E-08	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	6.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Fluorene	97	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53	mg/kg	3.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-06	5.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	6.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	290	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								9.3E-05					0.007
		Exposure Point Total									1.8E-04					0.01
	Exposure Medium Total										1.8E-04					0.01
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	7.0E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-12	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	1.7E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	6.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	2.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-11	3.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	2.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.5E-10	3.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	1.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-11	2.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	6.6E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	7.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	2.1E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.3E-12	3.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	3.7E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.4E-11	5.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	8.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.3E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.8E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	9.7E-07	8.3E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.03
				Phenanthrene	3.5E-4	mg/m^3	2.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-07					0.03
		Exposure Point Total									9.7E-07					0.03
	Exposure Medium Total										9.7E-07					0.03
Medium Total											1.8E-04					0.04
										Total of Receptor Risks Across All Media	1.9E-04				Total of Receptor Hazards Across All Media	0.04

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-06	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	2.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-05	4.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-06	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-05	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	8.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-04					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	4.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-06	9.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	7.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-05	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	8.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.9E-06	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	5.3E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	6.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.7E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	3.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-06	7.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.8E-05					--
		Exposure Point Total									2.5E-04					--
	Exposure Medium Total										2.5E-04					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	9.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-10	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	1.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.0E-11	3.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.4E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	7.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-12	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-10					--
		Exposure Point Total									2.4E-10					--
	Exposure Medium Total										2.4E-10					--
Medium Total											2.5E-04					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	8.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.03
				Mercury	2.00	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				2-Methylnaphthalene	93.0	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.3
				Acenaphthylene	110	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-03	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.02
				Benzo(a)anthracene	130	mg/kg	7.6E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.5E-04	1.7E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	8.2E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.0E-03	1.8E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.4E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-04	1.4E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.03
				Benzo(k)fluoranthene	44.0	mg/kg	2.6E-04	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.9E-05	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.6E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.5E-06	1.7E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.3E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-04	2.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-03	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.06
				Fluorene	97.0	mg/kg	1.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.03
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-04	6.8E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.1
				Phenanthrene	400	mg/kg	4.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.2
				Pyrene	290	mg/kg	3.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.1
			Exp. Route Total								8.2E-03					1.0

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.08
				Acenaphthylene	110	mg/kg	4.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.009
				Benzo(a)anthracene	130	mg/kg	2.8E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-04	6.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	3.0E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-03	6.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.3E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-04	5.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Benzo(k)fluoranthene	44.0	mg/kg	9.4E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.8E-06	2.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.8E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-06	6.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-04	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	7.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.02
				Fluorene	97.0	mg/kg	3.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.01
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.2E-05	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	7.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				Phenanthrene	400	mg/kg	1.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.06
				Pyrene	290	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.04
			Exp. Route Total								3.0E-03					0.3
		Exposure Point Total									1.1E-02					1.3
	Exposure Medium Total										1.1E-02					1.3
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	7.0E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.2E-11	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	1.8E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-03	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	6.4E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	6.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-10	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	6.5E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.2E-09	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	5.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-10	1.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	6.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	2.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-10	4.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	6.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	6.7E-11	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	1.1E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.3E-09	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	2.5E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-10	5.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.9E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	9.8E-06	3.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	1.1
				Phenanthrene	3.5E-4	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.5E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.8E-06					1.1
		Exposure Point Total									9.8E-06					1.1
	Exposure Medium Total										9.8E-06					1.1
Medium Total											1.1E-02					2.4
										Total of Receptor Risks Across All Media	1.1E-02				Total of Receptor Hazards Across All Media	2.4

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-05	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	3.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-06	5.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.6E-07	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-06	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	8.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.5E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.2E-08	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-07	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	6.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-05					--
		Exposure Point Total									4.2E-05					--
	Exposure Medium Total										4.2E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.3E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	2.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-10	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	2.4E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-11	3.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.9E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.3E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	9.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-10					--
		Exposure Point Total									3.3E-10					--
	Exposure Medium Total										3.3E-10					--
Medium Total											4.2E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	3.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.003
				Mercury	2.00	mg/kg	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				2-Methylnaphthalene	93.0	mg/kg	4.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.03
				Acenaphthylene	110	mg/kg	5.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.003
				Benzo(a)anthracene	130	mg/kg	1.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.2E-05	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.2E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.8E-04	1.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	9.5E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-05	1.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	3.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
				Benzo(k)fluoranthene	44.0	0E+00	3.8E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.8E-06	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	1.1E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	8.2E-07	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	2.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	8.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.006
				Fluorene	97.0	0E+00	4.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	4.6E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-05	7.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	8.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.01
				Phenanthrene	400	0E+00	1.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
				Pyrene	290	0E+00	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
			Exp. Route Total								1.2E-03					0.1

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	2.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	5.8E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-05	9.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	6.3E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-04	9.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	4.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-05	7.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	1.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	0E+00	2.0E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.4E-06	3.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	5.8E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.2E-07	9.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	1.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-05	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	4.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	0E+00	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	2.4E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-05	3.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	4.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.007
				Phenanthrene	400	0E+00	9.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.009
				Pyrene	290	0E+00	7.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.007
			Exp. Route Total								6.3E-04					0.04
		Exposure Point Total									1.8E-03					0.1
	Exposure Medium Total										1.8E-03					0.1
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	2.8E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.2E-11	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	7.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	4.5E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-03	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	2.6E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	8.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.2E-10	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	9.0E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.9E-09	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	7.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.8E-10	1.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	2.8E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-10	4.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	8.4E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	9.2E-11	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	1.5E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.8E-09	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	6.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	9.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	3.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.8E-10	5.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	1.1E-03	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.9E-05	3.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	1.1
				Phenanthrene	3.5E-4	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	1.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.9E-05					1.1
		Exposure Point Total									3.9E-05					1.1
	Exposure Medium Total										3.9E-05					1.1
Medium Total											1.9E-03					1.3
										Total of Receptor Risks Across All Media	1.9E-03				Total of Receptor Hazards Across All Media	1.3

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	2.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-08	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-09	7.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.2E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	3.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	5.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.3E-08	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	6.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.0E-09	4.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	4.5E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.3E-10	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	5.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-09	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	2.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.7E-08					--
		Exposure Point Total									2.8E-07					--
	Exposure Medium Total										2.8E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-14	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	3.4E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.8E-13	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	4.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-14	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.6E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.9E-14	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.1E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.8E-14	2.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.6E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-14	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.3E-13					--
		Exposure Point Total									5.3E-13					--
	Exposure Medium Total										5.3E-13					--
Medium Total											2.8E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	5.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-07	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.0010
				Mercury	2.00	mg/kg	1.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	6.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	7.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0009
				Benzo(a)anthracene	130	mg/kg	9.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.6E-07	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-06	6.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-07	5.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	5.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	3.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.2E-08	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	9.0E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.6E-09	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.005
				Phenanthrene	400	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
			Exp. Route Total								9.7E-06					0.04

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44.0	mg/kg	7.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.8E-09	5.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.3E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.7E-09	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-07	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	97.0	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	9.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-08	6.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	290	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.5E-06					0.008
		Exposure Point Total									1.2E-05					0.04
	Exposure Medium Total										1.2E-05					0.04
	Air	OU9	Inhalation	Antimony	5.6E-7	mg/m^3	5.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.8E-08	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.6E-08	(mg/m^3)	3.5E-05	(mg/m^3)	0.003
				2-Methylnaphthalene	0.007	mg/m^3	7.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	4.2E-3	mg/m^3	4.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	9.1E-5	mg/m^3	8.9E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.8E-09	6.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	9.8E-5	mg/m^3	9.6E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-07	6.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	7.7E-5	mg/m^3	7.5E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.3E-09	5.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	5.3E-5	mg/m^3	5.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	3.1E-5	mg/m^3	3.0E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-09	2.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	9.1E-5	mg/m^3	8.9E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	9.8E-10	6.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.9E-08	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.3E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	1.5E-3	mg/m^3	1.5E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.7E-5	mg/m^3	3.6E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.0E-09	2.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.018	mg/m^3	1.8E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	6.2E-07	1.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.4
				Phenanthrene	2.1E-3	mg/m^3	2.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	2.0E-4	mg/m^3	2.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-05	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.7E-07					0.4
		Exposure Point Total									7.7E-07					0.4
	Exposure Medium Total										7.7E-07					0.4
Medium Total											1.3E-05					0.5
										Total of Receptor Risks Across All Media	1.3E-05				Total of Receptor Hazards Across All Media	0.5

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.0E-08	8.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	2.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.4E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	8.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.0E-08	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	3.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-08	2.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.4E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.7E-09	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.0E-07					--
		Exposure Point Total									2.1E-06					--
	Exposure Medium Total										2.1E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	5.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.0E-13	4.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	9.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.0E-11	7.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	1.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-12	8.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	6.9E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.5E-13	5.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	8.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	9.9E-13	6.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	4.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-13	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.4E-11					--
		Exposure Point Total									1.4E-11					--
	Exposure Medium Total										1.4E-11					--
Medium Total											2.1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-07	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.0009
				Mercury	2.00	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.010
				Acenaphthylene	110	mg/kg	6.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0008
				Benzo(a)anthracene	130	mg/kg	7.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-06	5.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	7.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.6E-05	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-06	4.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	2.4E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.8E-07	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.2E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.2E-08	5.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.3E-06	9.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	9.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	5.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	2.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-06	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.004
				Phenanthrene	400	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								7.8E-05					0.03

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	6.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001
				Acenaphthylene	110	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	130	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.0E-07	9.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.7E-06	1.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-07	8.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	44.0	mg/kg	4.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.0E-08	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.2E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	9.0E-09	9.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	97.0	mg/kg	9.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	5.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-07	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0007
				Phenanthrene	400	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0010
				Pyrene	290	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0007
			Exp. Route Total								1.3E-05					0.005
		Exposure Point Total									9.1E-05					0.04
	Exposure Medium Total										9.1E-05					0.04
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	2.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-11	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	5.5E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	3.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	2.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	3.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.9E-11	2.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	3.8E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.2E-10	3.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	3.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-11	2.3E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	2.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	9.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	3.6E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.9E-12	2.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	6.3E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.6E-11	4.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	4.9E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	7.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	1.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-11	1.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	9.0E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.1E-06	7.0E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.2
				Phenanthrene	3.5E-4	mg/m^3	8.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	8.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.2E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-06					0.2
		Exposure Point Total									3.1E-06					0.2
	Exposure Medium Total										3.1E-06					0.2
Medium Total											9.4E-05					0.3
										Total of Receptor Risks Across All Media	9.6E-05				Total of Receptor Hazards Across All Media	0.3

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	4.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-07	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	7.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	5.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	6.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.6E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-08	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	9.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
		Exp. Route Total									1.9E-06					--
		Exposure Point Total									8.6E-06					--
	Exposure Medium Total										8.6E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-13	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-12	4.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	2.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-13	4.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-13	3.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.0E-13	3.7E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	8.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.2E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
		Exp. Route Total									2.8E-12					--
		Exposure Point Total									2.8E-12					--
	Exposure Medium Total										2.8E-12					--
Medium Total											8.6E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.0009
				Mercury	2.00	mg/kg	7.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0008
				Benzo(a)anthracene	130	mg/kg	2.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-05	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-04	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-05	5.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	9.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.7E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	7.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.1E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.1E-06	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	7.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.004
				Phenanthrene	400	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								2.9E-04					0.03

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	8.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	7.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-06	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	8.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-05	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-06	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44.0	mg/kg	2.7E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.9E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.8E-08	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.4E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-05	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	97.0	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-06	7.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	4.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	290	mg/kg	3.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								8.6E-05					0.008
		Exposure Point Total									3.8E-04					0.04
	Exposure Medium Total										3.8E-04					0.04
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	8.4E-14	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.7E-13	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	2.1E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	7.6E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	7.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.0E-12	1.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	7.8E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.6E-11	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	6.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	7.9E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	2.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-12	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	7.2E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	8.0E-13	1.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	1.3E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.5E-11	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	3.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-12	6.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	3.4E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.2E-07	4.0E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.01
				Phenanthrene	3.5E-4	mg/m^3	3.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	3.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-07					0.01
		Exposure Point Total									1.2E-07					0.01
	Exposure Medium Total										1.2E-07					0.01
Medium Total											3.8E-04					0.06
										Total of Receptor Risks Across All Media	3.9E-04				Total of Receptor Hazards Across All Media	0.06

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	3.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	5.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	8.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	6.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-08	9.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	4.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-08	7.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.1E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	9.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	1.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	2.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.7E-10	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	2.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	7.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.5E-07					--
		Exposure Point Total									6.6E-07					--
	Exposure Medium Total										6.6E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	8.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.8E-14	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-12	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	1.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-13	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	1.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-13	1.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	6.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-14	9.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-12					--
		Exposure Point Total									2.0E-12					--
	Exposure Medium Total										2.0E-12					--
Medium Total											6.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.80	mg/kg	7.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-08	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.00005
				Mercury	2.0	mg/kg	1.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				2-Methylnaphthalene	93.0	mg/kg	8.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0006
				Acenaphthylene	110	mg/kg	9.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00005
				Benzo(a)anthracene	130	mg/kg	2.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-06	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-05	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	6.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00006
				Benzo(k)fluoranthene	44.0	mg/kg	7.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.1E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	3.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-06	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	97.0	mg/kg	8.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00006
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	8.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.2E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	400	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	290	mg/kg	2.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								2.3E-05					0.002

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.80	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0001
				Acenaphthylene	110	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00001
				Benzo(a)anthracene	130	mg/kg	6.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-07	9.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	6.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	5.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-07	8.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00002
				Benzo(k)fluoranthene	44.0	mg/kg	2.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	6.2E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.5E-09	9.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.0E-07	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Fluorene	97.0	mg/kg	2.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	4.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00007
				Phenanthrene	400	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
				Pyrene	290	mg/kg	7.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00007
			Exp. Route Total								6.7E-06					0.0005
		Exposure Point Total									2.9E-05					0.002
	Exposure Medium Total										2.9E-05					0.002
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	1.7E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.1E-13	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	4.3E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	1.4E-03	mg/m^3	2.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	1.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	5.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-12	8.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	5.6E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	6.1E-11	8.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	4.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.8E-12	7.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	1.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	5.2E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	5.7E-13	8.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	9.2E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-11	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	3.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	5.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	2.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-12	3.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	3.5E-03	mg/m^3	7.1E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.4E-07	2.1E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.007
				Phenanthrene	3.5E-4	mg/m^3	7.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	6.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-07					0.007
		Exposure Point Total									2.4E-07					0.007
	Exposure Medium Total										2.4E-07					0.007
Medium Total											2.9E-05					0.009
										Total of Receptor Risks Across All Media	3.0E-05				Total of Receptor Hazards Across All Media	0.009

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	8.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	3.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-06	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.0E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.4E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-07	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.5E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-06	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	4.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-07	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.9E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-08	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-07	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-07	9.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.7E-06					--
		Exposure Point Total									2.9E-05					--
	Exposure Medium Total										2.9E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	4.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.6E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	4.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.3E-12	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	3.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.8E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.6E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.4E-11					--
		Exposure Point Total									6.4E-11					--
	Exposure Medium Total										6.4E-11					--
Medium Total											2.9E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	9.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-06	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.009
				Mercury	2.00	mg/kg	2.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				2-Methylnaphthalene	93.0	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.10
				Acenaphthylene	110	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.008
				Benzo(a)anthracene	130	mg/kg	1.0E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-05	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.1E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.1E-04	6.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	8.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-05	4.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	9.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Benzo(k)fluoranthene	44.0	mg/kg	3.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.5E-06	1.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.0E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.5E-07	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.8E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-04	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.02
				Fluorene	97.0	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.01
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	4.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-05	2.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				Phenanthrene	400	mg/kg	4.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.06
				Pyrene	290	mg/kg	3.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.04
			Exp. Route Total								1.1E-03					0.3

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	1.5E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-05	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.6E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-04	8.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-06	6.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	5.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.7E-07	2.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.5E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.1E-07	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	6.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-06	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.006
				Phenanthrene	400	mg/kg	7.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.008
				Pyrene	290	mg/kg	5.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
			Exp. Route Total								1.6E-04					0.04
		Exposure Point Total									1.3E-03					0.4
	Exposure Medium Total										1.3E-03					0.4
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	1.6E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.5E-11	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	3.9E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	2.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	1.4E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.0E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	1.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-10	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	1.8E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-09	9.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	7.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	1.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	5.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-11	3.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	1.7E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.8E-11	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	2.9E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-10	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	3.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	5.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	6.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.4E-11	3.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	6.4E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.2E-06	2.2E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.7
				Phenanthrene	3.5E-4	mg/m^3	6.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	5.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-06					0.7
		Exposure Point Total									2.2E-06					0.7
	Exposure Medium Total										2.2E-06					0.7
Medium Total											1.3E-03					1.1
										Total of Receptor Risks Across All Media	1.3E-03				Total of Receptor Hazards Across All Media	1.1

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	9.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-08	6.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-07	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	3.80	mg/kg	4.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.9E-09	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-07					--
		Exposure Point Total									2.6E-06					--
	Exposure Medium Total										2.6E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	3.5E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.9E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.1E-10	mg/m^3	4.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-12	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.2E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.9E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.4E-11					--
		Exposure Point Total									5.4E-11					--
	Exposure Medium Total										5.4E-11					--
Medium Total											2.6E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.800	mg/kg	3.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	4.0E-04	(mg/kg/day)	0.0009
				Mercury	2.00	mg/kg	9.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	5.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0008
				Benzo(a)anthracene	130	mg/kg	9.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.8E-06	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.4E-05	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	7.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-06	5.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	0E+00	3.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.3E-07	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	9.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.8E-08	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	8.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	0E+00	4.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	3.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-06	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	8.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.004
				Phenanthrene	400	0E+00	1.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	0E+00	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								1.0E-04					0.03

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.800	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	4.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001
				Acenaphthylene	110	mg/kg	7.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	8.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	9.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-07	7.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	44.0	0E+00	4.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.4E-08	3.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	8.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	97.0	0E+00	6.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	5.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.1E-07	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	400	0E+00	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Pyrene	290	0E+00	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0007
			Exp. Route Total								1.5E-05					0.004
		Exposure Point Total									1.2E-04					0.04
	Exposure Medium Total										1.2E-04					0.04
	Air	OU9	Inhalation	Antimony	8.5E-11	mg/m^3	5.5E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.5E-11	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.1E-10	mg/m^3	1.4E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	8.7E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	5.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.0E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	1.5E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-09	9.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	1.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-10	7.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	5.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	4.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.2E-11	3.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	1.4E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.5E-11	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	2.5E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.0E-10	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	1.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	5.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.3E-11	3.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.2E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	7.6E-06	2.2E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.7
				Phenanthrene	3.5E-4	mg/m^3	2.2E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.6E-06					0.7
		Exposure Point Total									7.6E-06					0.7
	Exposure Medium Total										7.6E-06					0.7
Medium Total											1.2E-04					0.8
										Total of Receptor Risks Across All Media	1.3E-04				Total of Receptor Hazards Across All Media	0.8

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil Including Background
9.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil Including Background
9.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil Including Background
9.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil Including Background
9.5.RME	Lifetime Recreational Users - Entire Site Surface/Subsurface Soil Including Background
9.6.RME	Child Residents - Entire Site Surface/Subsurface Soil Including Background
9.7.RME	Adult Residents - Entire Site Surface/Subsurface Soil Including Background
9.8.RME	Lifetime Residents - Entire Site Surface/Subsurface Soil Including Background
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil Including Background
9.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil Including Background
9.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil Including Background
9.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil Including Background
9.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil Including Background
9.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil Including Background

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Benzo(a)pyrene	7E-07	--	3E-07	--	9E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	8E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	5E-09	--	2E-09	--	7E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	2E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	9E-07	--	3E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-09	--	--	5E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-10	--	--	5E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Chemical Total	--	7E-09	--	--	7E-09		- -	--	- -	--
		Exposure Point Total						7E-09					--
	Exposure Medium Total							7E-09					--
Medium Total								1E-06					--

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.004	- -	--	0.004
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.05	- -	0.01	0.06
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.004	- -	0.001	0.005
			Benzo(a)anthracene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	4E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	9E-07	--	3E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.005	- -	0.002	0.007
			Benzo(k)fluoranthene	9E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	2E-06	--	6E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.009	- -	0.003	0.01
			Fluorene	- -	--	- -	--	- -	Blood	0.005	- -	0.002	0.007
			Indeno(1,2,3-cd)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.02	- -	0.007	0.03
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.03	- -	0.01	0.04
			Pyrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.007	0.03
			Chemical Total	4E-05	--	2E-05	--	5E-05		0.1	--	0.05	0.2
		Exposure Point Total						5E-05					0.2
Exposure Medium Total								5E-05					0.2

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	0.005	- -	0.005
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-07	--	--	2E-07	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Chrysene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-08	--	--	4E-08	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.8	- -	0.8
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.8	- -	0.8
		Exposure Point Total						2E-06					0.8
	Exposure Medium Total							2E-06					0.8
Medium Total								6E-05					1
Receptor Total							Receptor Risk Total	6E-05				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.01
Total Blood HI	0.02
Total Body Weight HI	0.03
Total Kidney HI	0.06
Total Liver HI	0.02
Total Lungs HI	0.06
Total Nasal HI	0.8

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	8E-06	--	7E-06	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-06	--	8E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	6E-08	--	5E-08	--	1E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	7E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	4E-07	--	3E-07	--	7E-07	NA	--	- -	--	--
			Chemical Total	1E-05	--	1E-05	--	2E-05		--	--	--	--
		Exposure Point Total						2E-05					--
	Exposure Medium Total							2E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Chemical Total	--	4E-11	--	--	4E-11		- -	--	- -	--
		Exposure Point Total						4E-11					--
	Exposure Medium Total							4E-11					--
Medium Total								2E-05					--

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.002	- -	--	0.002
			Mercury	- -	--	- -	--	- -	Autoimmune	0.007	- -	--	0.007
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.02	- -	0.02	0.04
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.002	- -	0.002	0.003
			Benzo(a)anthracene	3E-05	--	3E-05	--	6E-05	NA	--	- -	--	--
			Benzo(a)pyrene	4E-04	--	3E-04	--	7E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.002	- -	0.002	0.005
			Benzo(k)fluoranthene	1E-06	--	1E-06	--	2E-06	NA	--	- -	--	--
			Chrysene	3E-07	--	3E-07	--	6E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-05	--	5E-05	--	1E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.004	- -	0.004	0.008
			Fluorene	- -	--	- -	--	- -	Blood	0.002	- -	0.002	0.004
			Indeno(1,2,3-cd)pyrene	1E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.009	- -	0.008	0.02
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.01	- -	0.01	0.02
			Pyrene	- -	--	- -	--	- -	Kidney	0.009	- -	0.008	0.02
			Chemical Total	5E-04	--	4E-04	--	9E-04		0.07	--	0.05	0.1
		Exposure Point Total						9E-04					0.1
Exposure Medium Total								9E-04					0.1

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Chrysene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Naphthalene	--	1E-05	--	--	1E-05	Nasal	- -	0.3	- -	0.3
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-05	--	--	1E-05		- -	0.3	- -	0.3
		Exposure Point Total						1E-05					0.3
	Exposure Medium Total							1E-05					0.3
Medium Total								9E-04					0.4
Receptor Total							Receptor Risk Total	9E-04				Receptor HI Total	0.4

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.007
Total Blood HI	0.010
Total Body Weight HI	0.02
Total Kidney HI	0.04
Total Liver HI	0.01
Total Lungs HI	0.04
Total Nasal HI	0.3

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-07	--	1E-07	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	7E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	3E-05	--	2E-05	--	5E-05		--	--	--	--
		Exposure Point Total						5E-05					--
	Exposure Medium Total							5E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								5E-05					--

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.004	- -	--	0.004
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.04	- -	0.02	0.07
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.003	- -	0.002	0.006
			Benzo(a)anthracene	8E-05	--	6E-05	--	1E-04	NA	--	- -	--	--
			Benzo(a)pyrene	9E-04	--	6E-04	--	1E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	7E-05	--	5E-05	--	1E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.005	- -	0.003	0.008
			Benzo(k)fluoranthene	3E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Chrysene	8E-07	--	6E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-04	--	1E-04	--	2E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.008	- -	0.006	0.01
			Fluorene	- -	--	- -	--	- -	Blood	0.004	- -	0.003	0.008
			Indeno(1,2,3-cd)pyrene	3E-05	--	2E-05	--	6E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.02	- -	0.01	0.03
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.02	0.04
			Pyrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.01	0.03
			Chemical Total	1E-03	--	9E-04	--	2E-03		0.1	--	0.08	0.2
		Exposure Point Total						2E-03					0.2
Exposure Medium Total								2E-03					0.2

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	5E-07	--	--	5E-07	Nasal	- -	0.05	- -	0.05
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	5E-07	--	--	5E-07		- -	0.05	- -	0.05
		Exposure Point Total						5E-07					0.05
	Exposure Medium Total							5E-07					0.05
Medium Total								2E-03					0.3
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	0.3

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.01
Total Blood HI	0.02
Total Body Weight HI	0.03
Total Kidney HI	0.07
Total Liver HI	0.02
Total Lungs HI	0.07
Total Nasal HI	0.05

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	9E-08	--	1E-07	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	3E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	1E-08	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-08	--	7E-08	--	1E-07	NA	--	- -	--	--
			Chemical Total	2E-06	--	2E-06	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-06					--
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Chemical Total	--	8E-12	--	--	8E-12		- -	--	- -	--
		Exposure Point Total						8E-12					--
	Exposure Medium Total							8E-12					--
Medium Total								4E-06					--

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.0002	- -	--	0.0002
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0007	- -	--	0.0007
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	- -	0.002	0.004
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0002	- -	0.0002	0.0004
			Benzo(a)anthracene	6E-06	--	6E-06	--	1E-05	NA	--	- -	--	--
			Benzo(a)pyrene	7E-05	--	7E-05	--	1E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	5E-06	--	5E-06	--	1E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0003	0.0005
			Benzo(k)fluoranthene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chrysene	6E-08	--	6E-08	--	1E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	1E-05	--	2E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0005	- -	0.0005	0.0009
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.0003	0.0005
			Indeno(1,2,3-cd)pyrene	2E-06	--	3E-06	--	5E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0010	- -	0.001	0.002
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.001	- -	0.001	0.003
			Pyrene	- -	--	- -	--	- -	Kidney	0.0010	- -	0.001	0.002
			Chemical Total	9E-05	--	9E-05	--	2E-04		0.008	--	0.007	0.01
		Exposure Point Total						2E-04					0.01
Exposure Medium Total								2E-04					0.01

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Chrysene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.03	- -	0.03
		Exposure Point Total						1E-06					0.03
	Exposure Medium Total							1E-06					0.03
Medium Total								2E-04					0.04
Receptor Total							Receptor Risk Total	2E-04				Receptor HI Total	0.04

Total Blood HI	0.001
Total Body Weight HI	0.002
Total Kidney HI	0.005
Total Liver HI	0.001
Total Lungs HI	0.004
Total Nasal HI	0.03

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	1E-06	--	1E-06	--	2E-06
			Benzo(a)pyrene	2E-05	--	2E-05	--	4E-05
			Benzo(b)fluoranthene	2E-06	--	2E-06	--	4E-06
			Benzo(k)fluoranthene	2E-07	--	1E-07	--	3E-07
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06
			Indeno(1,2,3-cd)pyrene	1E-06	--	7E-07	--	2E-06
			Chemical Total	3E-05	--	2E-05	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
	Air	OU9	Benzo(a)anthracene	--	8E-13	--	--	8E-13
			Benzo(a)pyrene	--	1E-11	--	--	1E-11
			Benzo(b)fluoranthene	--	2E-12	--	--	2E-12
			Benzo(k)fluoranthene	--	1E-12	--	--	1E-12
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13
			Chemical Total	--	2E-11	--	--	2E-11
		Exposure Point Total						2E-11
	Exposure Medium Total							2E-11
Medium Total								5E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	9E-05	--	6E-05	--	1E-04
			Benzo(a)pyrene	9E-04	--	7E-04	--	2E-03
			Benzo(b)fluoranthene	7E-05	--	5E-05	--	1E-04
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	3E-06	--	2E-06	--	5E-06
			Chrysene	9E-07	--	6E-07	--	1E-06
			Dibenzo(a,h)anthracene	2E-04	--	1E-04	--	3E-04
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	3E-05	--	3E-05	--	6E-05
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	1E-03	--	9E-04	--	2E-03
		Exposure Point Total						2E-03
	Exposure Medium Total							2E-03

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	5E-11	--	--	5E-11
			Benzo(a)pyrene	--	6E-10	--	--	6E-10
			Benzo(b)fluoranthene	--	5E-11	--	--	5E-11
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11
			Chrysene	--	5E-12	--	--	5E-12
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11
			Naphthalene	--	1E-06	--	--	1E-06
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	1E-06	--	--	1E-06
		Exposure Point Total						1E-06
	Exposure Medium Total							1E-06
Medium Total								2E-03
Receptor Total							Receptor Risk Total	2E-03

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	9E-06	--	3E-06	--	1E-05	NA	--	- -	--	--
			Benzo(a)pyrene	1E-04	--	5E-05	--	2E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-05	--	6E-06	--	2E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Chemical Total	2E-04	--	7E-05	--	3E-04		--	--	--	--
		Exposure Point Total						3E-04					--
	Exposure Medium Total							3E-04					--
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Chemical Total	--	2E-10	--	--	2E-10		- -	--	- -	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
Medium Total								3E-04					--

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.03	- -	--	0.03
			Mercury	- -	--	- -	--	- -	Autoimmune	0.09	- -	--	0.09
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.3	- -	0.08	0.4
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.02	- -	0.009	0.03
			Benzo(a)anthracene	6E-04	--	2E-04	--	8E-04	NA	--	- -	--	--
			Benzo(a)pyrene	6E-03	--	2E-03	--	8E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	5E-04	--	2E-04	--	6E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.03	- -	0.01	0.04
			Benzo(k)fluoranthene	2E-05	--	7E-06	--	3E-05	NA	--	- -	--	--
			Chrysene	6E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-03	--	4E-04	--	1E-03	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.06	- -	0.02	0.08
			Fluorene	- -	--	- -	--	- -	Blood	0.03	- -	0.01	0.04
			Indeno(1,2,3-cd)pyrene	2E-04	--	8E-05	--	3E-04	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.1	- -	0.04	0.2
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.2	- -	0.06	0.2
			Pyrene	- -	--	- -	--	- -	Kidney	0.1	- -	0.04	0.2
			Chemical Total	8E-03	--	3E-03	--	1E-02		1.0	--	0.3	1
		Exposure Point Total						1E-02					1
Exposure Medium Total								1E-02					1

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Chrysene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Naphthalene	--	1E-05	--	--	1E-05	Nasal	- -	1	- -	1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-05	--	--	1E-05		- -	1	- -	1
		Exposure Point Total						1E-05					1
	Exposure Medium Total							1E-05					1
Medium Total								1E-02					2
Receptor Total							Receptor Risk Total	1E-02				Receptor HI Total	2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.09
Total Blood HI	0.10
Total Body Weight HI	0.2
Total Kidney HI	0.4
Total Liver HI	0.1
Total Lungs HI	0.4
Total Nasal HI	1

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-07	--	8E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	5E-07	--	1E-06	NA	--	- -	--	--
			Chemical Total	3E-05	--	1E-05	--	4E-05		--	--	--	--
		Exposure Point Total						4E-05					--
	Exposure Medium Total							4E-05					--
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	--	- -	--
		Exposure Point Total						3E-10					--
	Exposure Medium Total							3E-10					--
Medium Total								4E-05					--

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.003	- -	--	0.003
			Mercury	- -	--	- -	--	- -	Autoimmune	0.009	- -	--	0.009
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.03	- -	0.01	0.04
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.003	- -	0.001	0.004
			Benzo(a)anthracene	8E-05	--	4E-05	--	1E-04	NA	--	- -	--	--
			Benzo(a)pyrene	9E-04	--	5E-04	--	1E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	7E-05	--	4E-05	--	1E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.003	- -	0.002	0.005
			Benzo(k)fluoranthene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Chrysene	8E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-04	--	7E-05	--	2E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.006	- -	0.003	0.009
			Fluorene	- -	--	- -	--	- -	Blood	0.003	- -	0.002	0.005
			Indeno(1,2,3-cd)pyrene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.01	- -	0.007	0.02
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.009	0.03
			Pyrene	- -	--	- -	--	- -	Kidney	0.01	- -	0.007	0.02
			Chemical Total	1E-03	--	6E-04	--	2E-03		0.1	--	0.04	0.1
		Exposure Point Total						2E-03					0.1
Exposure Medium Total								2E-03					0.1

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	9E-10	--	--	9E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-08	--	--	1E-08	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	8E-10	--	--	8E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Chrysene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Naphthalene	--	4E-05	--	--	4E-05	Nasal	- -	1	- -	1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-05	--	--	4E-05		- -	1	- -	1
		Exposure Point Total						4E-05					1
	Exposure Medium Total							4E-05					1
Medium Total								2E-03					1
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.009
Total Blood HI	0.01
Total Body Weight HI	0.02
Total Kidney HI	0.05
Total Liver HI	0.01
Total Lungs HI	0.04
Total Nasal HI	1

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	1E-05	--	4E-06	--	1E-05
			Benzo(a)pyrene	2E-04	--	6E-05	--	2E-04
			Benzo(b)fluoranthene	2E-05	--	7E-06	--	3E-05
			Benzo(k)fluoranthene	1E-06	--	5E-07	--	2E-06
			Dibenzo(a,h)anthracene	1E-05	--	6E-06	--	2E-05
			Indeno(1,2,3-cd)pyrene	7E-06	--	3E-06	--	1E-05
			Chemical Total	2E-04	--	8E-05	--	3E-04
		Exposure Point Total						3E-04
	Exposure Medium Total							3E-04
	Air	OU9	Benzo(a)anthracene	--	2E-11	--	--	2E-11
			Benzo(a)pyrene	--	4E-10	--	--	4E-10
			Benzo(b)fluoranthene	--	5E-11	--	--	5E-11
			Benzo(k)fluoranthene	--	3E-11	--	--	3E-11
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11
			Chemical Total	--	6E-10	--	--	6E-10
		Exposure Point Total						6E-10
	Exposure Medium Total							6E-10
Medium Total								3E-04

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	6E-04	--	2E-04	--	9E-04
			Benzo(a)pyrene	7E-03	--	3E-03	--	9E-03
			Benzo(b)fluoranthene	5E-04	--	2E-04	--	7E-04
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	2E-05	--	8E-06	--	3E-05
			Chrysene	6E-06	--	2E-06	--	9E-06
			Dibenzo(a,h)anthracene	1E-03	--	4E-04	--	2E-03
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	3E-04	--	1E-04	--	4E-04
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	9E-03	--	4E-03	--	1E-02
		Exposure Point Total						1E-02
	Exposure Medium Total							1E-02

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	2E-09	--	--	2E-09
			Benzo(a)pyrene	--	2E-08	--	--	2E-08
			Benzo(b)fluoranthene	--	1E-09	--	--	1E-09
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	5E-10	--	--	5E-10
			Chrysene	--	2E-10	--	--	2E-10
			Dibenzo(a,h)anthracene	--	3E-09	--	--	3E-09
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	6E-10	--	--	6E-10
			Naphthalene	--	5E-05	--	--	5E-05
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	5E-05	--	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
Medium Total								1E-02
Receptor Total							Receptor Risk Total	1E-02

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	4E-08	--	2E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-08	--	5E-09	--	2E-08	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	3E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	8E-09	--	2E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	6E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Chemical Total	--	3E-09	--	--	3E-09		- -	--	- -	--
		Exposure Point Total						3E-09					--
	Exposure Medium Total							3E-09					--
Medium Total								3E-07					--

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.0010	- -	--	0.0010
			Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0009	- -	0.0002	0.001
			Benzo(a)anthracene	7E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	7E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-07	--	1E-07	--	7E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0003	0.002
			Benzo(k)fluoranthene	2E-08	--	6E-09	--	3E-08	NA	--	- -	--	--
			Chrysene	7E-09	--	2E-09	--	8E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	3E-07	--	1E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	3E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.005	- -	0.001	0.006
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.002	0.008
			Pyrene	- -	--	- -	--	- -	Kidney	0.005	- -	0.001	0.006
			Chemical Total	1E-05	--	3E-06	--	1E-05		0.04	--	0.008	0.04
		Exposure Point Total						1E-05					0.04
Exposure Medium Total								1E-05					0.04

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	0.003	- -	0.003
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-08	--	--	1E-08	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-07	--	--	1E-07	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Chrysene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Naphthalene	--	6E-07	--	--	6E-07	Nasal	- -	0.4	- -	0.4
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	8E-07	--	--	8E-07		- -	0.4	- -	0.4
		Exposure Point Total						8E-07					0.4
	Exposure Medium Total							8E-07					0.4
Medium Total								1E-05					0.5
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	0.5

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.004
Total Body Weight HI	0.006
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.4

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	2E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	2E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-08	--	1E-08	--	7E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	3E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								2E-06					--

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.0009	- -	--	0.0009
			Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.010	- -	0.001	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0008	- -	0.0001	0.0009
			Benzo(a)anthracene	5E-06	--	9E-07	--	6E-06	NA	--	- -	--	--
			Benzo(a)pyrene	6E-05	--	1E-05	--	7E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	4E-06	--	8E-07	--	5E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0002	0.001
			Benzo(k)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	5E-08	--	9E-09	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	9E-06	--	2E-06	--	1E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0003	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0002	0.001
			Indeno(1,2,3-cd)pyrene	2E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.004	- -	0.0007	0.005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.0010	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.0007	0.005
			Chemical Total	8E-05	--	1E-05	--	9E-05		0.03	--	0.005	0.04
		Exposure Point Total						9E-05					0.04
Exposure Medium Total								9E-05					0.04

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-11	--	--	8E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Naphthalene	--	3E-06	--	--	3E-06	Nasal	- -	0.2	- -	0.2
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-06	--	--	3E-06		- -	0.2	- -	0.2
		Exposure Point Total						3E-06					0.2
	Exposure Medium Total							3E-06					0.2
Medium Total								9E-05					0.3
Receptor Total							Receptor Risk Total	1E-04				Receptor HI Total	0.3

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.003
Total Body Weight HI	0.005
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.2

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	3E-07	--	9E-08	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	1E-06	--	6E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-07	--	2E-07	--	7E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-07	--	1E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	2E-06	--	9E-06		--	--	--	--
		Exposure Point Total						9E-06					--
	Exposure Medium Total							9E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								9E-06					--

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.0009	- -	--	0.0009
			Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0008	- -	0.0002	0.001
			Benzo(a)anthracene	2E-05	--	6E-06	--	3E-05	NA	--	- -	--	--
			Benzo(a)pyrene	2E-04	--	6E-05	--	3E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0003	0.001
			Benzo(k)fluoranthene	7E-07	--	2E-07	--	9E-07	NA	--	- -	--	--
			Chrysene	2E-07	--	6E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	8E-06	--	2E-06	--	1E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.004	- -	0.001	0.006
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.002	0.008
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.001	0.006
			Chemical Total	3E-04	--	9E-05	--	4E-04		0.03	--	0.008	0.04
		Exposure Point Total						4E-04					0.04
Exposure Medium Total								4E-04					0.04

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chrysene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Naphthalene	--	1E-07	--	--	1E-07	Nasal	- -	0.01	- -	0.01
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.01	- -	0.01
		Exposure Point Total						1E-07					0.01
	Exposure Medium Total							1E-07					0.01
Medium Total								4E-04					0.06
Receptor Total							Receptor Risk Total	4E-04				Receptor HI Total	0.06

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.003
Total Body Weight HI	0.006
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.01

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	1E-07	--	5E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	4E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	9E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	5E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	2E-07	--	7E-07		--	--	--	--
		Exposure Point Total						7E-07					--
	Exposure Medium Total							7E-07					--
	Air	OU9	Benzo(a)anthracene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-14	--	--	7E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								7E-07					--

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.00005	- -	--	0.00005
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0002	- -	--	0.0002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0006	- -	0.0001	0.0007
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00005	- -	0.00001	0.00006
			Benzo(a)anthracene	2E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00006	- -	0.00002	0.00008
			Benzo(k)fluoranthene	5E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Chrysene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-06	--	8E-07	--	3E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0001	- -	0.00003	0.0001
			Fluorene	- -	--	- -	--	- -	Blood	0.00006	- -	0.00002	0.00008
			Indeno(1,2,3-cd)pyrene	6E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0002	- -	0.00007	0.0003
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0003	- -	0.0001	0.0004
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00007	0.0003
			Chemical Total	2E-05	--	7E-06	--	3E-05		0.002	--	0.0005	0.002
		Exposure Point Total						3E-05					0.002
Exposure Medium Total								3E-05					0.002

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	2E-07	--	--	2E-07	Nasal	- -	0.007	- -	0.007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.007	- -	0.007
		Exposure Point Total						2E-07					0.007
	Exposure Medium Total							2E-07					0.007
Medium Total								3E-05					0.009
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	0.009

Total Blood HI	0.0002
Total Body Weight HI	0.0003
Total Kidney HI	0.0008
Total Liver HI	0.0002
Total Lungs HI	0.0007
Total Nasal HI	0.007

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-06	--	2E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	3E-06	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	3E-07	--	3E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	1E-07	--	1E-06	NA	--	- -	--	--
			Chemical Total	3E-05	--	4E-06	--	3E-05		--	--	--	--
		Exposure Point Total						3E-05					--
	Exposure Medium Total							3E-05					--
	Air	OU9	Benzo(a)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								3E-05					--

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.009	- -	--	0.009
			Mercury	- -	--	- -	--	- -	Autoimmune	0.03	- -	--	0.03
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.10	- -	0.01	0.1
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.008	- -	0.001	0.009
			Benzo(a)anthracene	8E-05	--	1E-05	--	9E-05	NA	--	- -	--	--
			Benzo(a)pyrene	8E-04	--	1E-04	--	9E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-05	--	9E-06	--	7E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.01	- -	0.002	0.01
			Benzo(k)fluoranthene	3E-06	--	4E-07	--	3E-06	NA	--	- -	--	--
			Chrysene	8E-07	--	1E-07	--	9E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-04	--	2E-05	--	2E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.02	- -	0.003	0.02
			Fluorene	- -	--	- -	--	- -	Blood	0.01	- -	0.002	0.01
			Indeno(1,2,3-cd)pyrene	3E-05	--	4E-06	--	4E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.04	- -	0.006	0.05
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.06	- -	0.008	0.07
			Pyrene	- -	--	- -	--	- -	Kidney	0.04	- -	0.006	0.05
			Chemical Total	1E-03	--	2E-04	--	1E-03		0.3	--	0.04	0.4
		Exposure Point Total						1E-03					0.4
Exposure Medium Total								1E-03					0.4

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chrysene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Naphthalene	--	2E-06	--	--	2E-06	Nasal	- -	0.7	- -	0.7
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.7	- -	0.7
		Exposure Point Total						2E-06					0.7
	Exposure Medium Total							2E-06					0.7
Medium Total								1E-03					1
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.03
Total Blood HI	0.03
Total Body Weight HI	0.05
Total Kidney HI	0.1
Total Liver HI	0.03
Total Lungs HI	0.1
Total Nasal HI	0.7

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	2E-09	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	3E-07	--	3E-06		--	--	--	--
		Exposure Point Total						3E-06					--
	Exposure Medium Total							3E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	5E-11	--	--	5E-11		- -	--	- -	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
Medium Total								3E-06					--

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	0.0009	- -	--	0.0009
			Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.001	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0008	- -	0.0001	0.0010
			Benzo(a)anthracene	7E-06	--	1E-06	--	8E-06	NA	--	- -	--	--
			Benzo(a)pyrene	7E-05	--	1E-05	--	8E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-06	--	9E-07	--	7E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0002	0.001
			Benzo(k)fluoranthene	2E-07	--	3E-08	--	3E-07	NA	--	- -	--	--
			Chrysene	7E-08	--	1E-08	--	8E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	2E-06	--	1E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0003	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0002	0.001
			Indeno(1,2,3-cd)pyrene	3E-06	--	4E-07	--	3E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.004	- -	0.0006	0.005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.0009	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.0007	0.005
			Chemical Total	1E-04	--	2E-05	--	1E-04		0.03	--	0.004	0.04
		Exposure Point Total						1E-04					0.04
Exposure Medium Total								1E-04					0.04

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Chrysene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Naphthalene	--	8E-06	--	--	8E-06	Nasal	- -	0.7	- -	0.7
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	8E-06	--	--	8E-06		- -	0.7	- -	0.7
		Exposure Point Total						8E-06					0.7
	Exposure Medium Total							8E-06					0.7
Medium Total								1E-04					0.8
Receptor Total							Receptor Risk Total	1E-04				Receptor HI Total	0.8

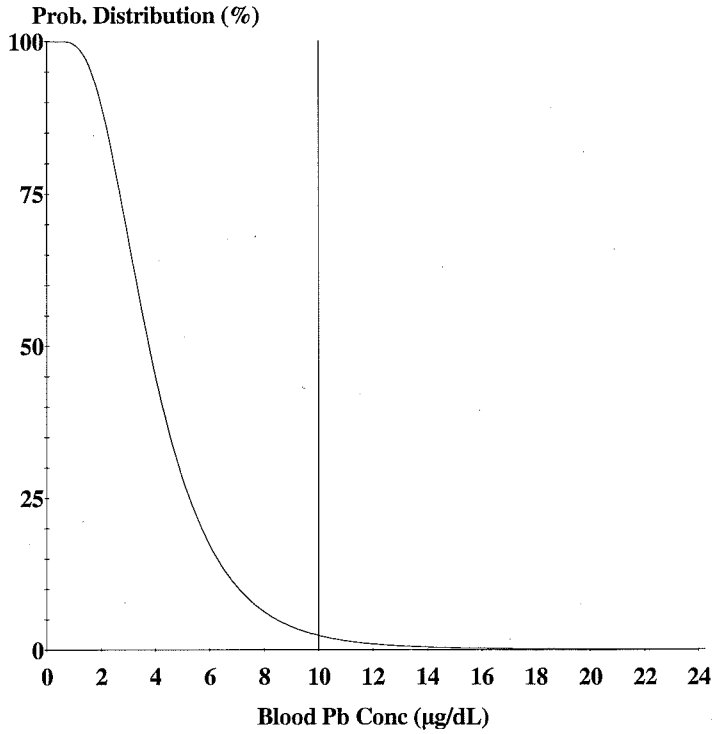
Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.003
Total Body Weight HI	0.005
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.7

I EUBK Output

Avg [Pb] for Entire Site



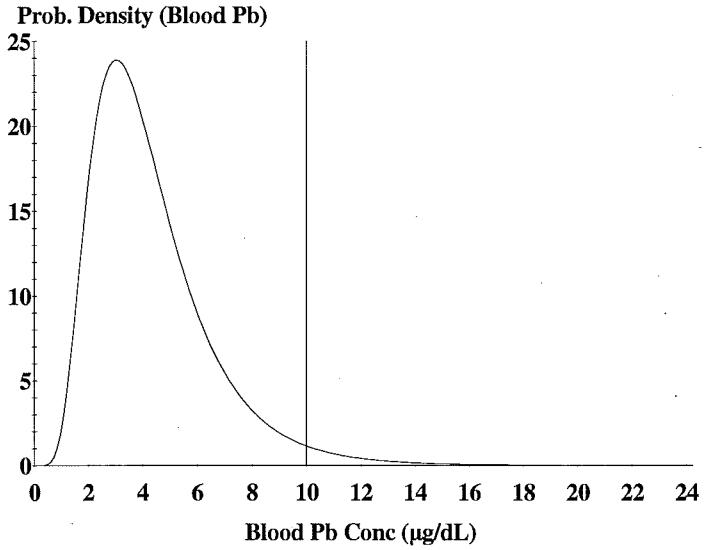
Cutoff = 10.000 µg/dl
Geo Mean = 3.960
GSD = 1.600
% Above = 2.437

Age Range = 0 to 84 months

Run Mode = Research

IEUBK Output

Avg [Pb] for Entire Site



Cutoff = 10.000 µg/dl
Geo Mean = 3.960
GSD = 1.600
% Above = 2.437
% Below = 97.563

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==========

Model Version: 1.1 Build9
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

I EUBK Output

==========

Average [Pb] for Entire Site

****** 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: 248.000 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	340.000	248.000
1-2	340.000	248.000
2-3	340.000	248.000
3-4	340.000	248.000
4-5	340.000	248.000
5-6	340.000	248.000
6-7	340.000	248.000

****** 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

IEUBK output

Avg [Pb] for Entire Site

****** 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	1.030	0.000	0.364
1-2	0.034	0.879	0.000	0.897
2-3	0.062	0.969	0.000	0.946
3-4	0.067	0.940	0.000	0.977
4-5	0.067	0.922	0.000	1.040
5-6	0.093	0.979	0.000	1.107
6-7	0.093	1.065	0.000	1.132

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	6.724	8.139	4.4
1-2	10.513	12.323	5.1
2-3	10.665	12.643	4.7
3-4	10.805	12.789	4.5
4-5	8.210	10.239	3.7
5-6	7.459	9.639	3.1
6-7	7.081	9.371	2.7

SUBSURFACE SOIL RISKS

TABLE 3.1A.RME
UNWEIGHTED EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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
OU9	Mercury	mg/kg	0.68	2.0 (G)	8.2	2.0	mg/kg	95% KM (Chebyshev) UCL	(1)
	2-Methylnaphthalene	mg/kg	32	93 (G)	560 (J)	93	mg/kg	95% KM (t) UCL	(1)
	Acenaphthylene	mg/kg	13	110 (NP)	370	110	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(a)anthracene	mg/kg	18	130 (L)	410 (J)	130	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(a)pyrene	mg/kg	19	140 (L)	450	140	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(b)fluoranthene	mg/kg	16	110 (NP)	360	110	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(g,h,i)perylene	mg/kg	11	76 (NP)	230	76	mg/kg	99% KM (Chebyshev) UCL	(1)
	Benzo(k)fluoranthene	mg/kg	6.4	44 (L)	130 (J)	44	mg/kg	99% KM (Chebyshev) UCL	(1)
	Chrysene	mg/kg	72	130 (NP)	420	130	mg/kg	99% KM (Chebyshev) UCL	(1)
	Dibenzo(a,h)anthracene	mg/kg	3.4	23 (NP)	66	23	mg/kg	99% KM (Chebyshev) UCL	(1)
	Fluoranthene	mg/kg	24	180 (NP)	550	180	mg/kg	99% KM (Chebyshev) UCL	(1)
	Fluorene	mg/kg	11	97 (L)	320	97	mg/kg	99% KM (Chebyshev) UCL	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	7.5	53 (L)	160	53	mg/kg	99% KM (Chebyshev) UCL	(1)
	Naphthalene	mg/kg	19	190 (NP)	640	190	mg/kg	99% KM (Chebyshev) UCL	(1)
	Phenanthrene	mg/kg	48	400 (NP)	1300	400	mg/kg	99% KM (Chebyshev) UCL	(1)
	Pyrene	mg/kg	39	290 (NP)	910 (J)	290	mg/kg	99% KM (Chebyshev) UCL	(1)

G = Gamma
L = Lognormal
NP = Non-parametric

(1) ProUCL Version 4.1.00 recommended value.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.2A.RME
EPCs WEIGHTED 90 PERCENT TO EXCAVATED AREA AND 10 PERCENT TO UNEXCAVATED AREA EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Mercury	mg/kg	0.73	0.82 (N)	8.2	0.82	mg/kg	T-statistic	(2)
	2-Methylnaphthalene	mg/kg	NA	NA	560 (J)	32	mg/kg	Excavated Area Mean	(1)
	Acenaphthylene	mg/kg	14	17 (N)	370	17	mg/kg	T-statistic	(2)
	Benzo(a)anthracene	mg/kg	20	23 (N)	410 (J)	23	mg/kg	T-statistic	(2)
	Benzo(a)pyrene	mg/kg	21	25 (N)	450	25	mg/kg	T-statistic	(2)
	Benzo(b)fluoranthene	mg/kg	17	20 (N)	360	20	mg/kg	T-statistic	(2)
	Benzo(g,h,i)perylene	mg/kg	12	14 (N)	230	14	mg/kg	T-statistic	(2)
	Benzo(k)fluoranthene	mg/kg	7.1	8.2 (N)	130 (J)	8.2	mg/kg	T-statistic	(2)
	Chrysene	mg/kg	20	23 (N)	420	23	mg/kg	T-statistic	(2)
	Dibenzo(a,h)anthracene	mg/kg	3.7	4.3 (N)	66	4.3	mg/kg	T-statistic	(2)
	Fluoranthene	mg/kg	27	31 (N)	550	31	mg/kg	T-statistic	(2)
	Fluorene	mg/kg	13	15 (N)	320	15	mg/kg	T-statistic	(2)
	Indeno(1,2,3-cd)pyrene	mg/kg	8.2	9.6 (N)	160	9.6	mg/kg	T-statistic	(2)
	Naphthalene	mg/kg	21	26 (N)	640	26	mg/kg	T-statistic	(2)
	Phenanthrene	mg/kg	53	64 (N)	1300	64	mg/kg	T-statistic	(2)
	Pyrene	mg/kg	43	51 (N)	910 (J)	51	mg/kg	T-statistic	(2)

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

1 2-methylnapthalene data was not collected from the unexcavated area so a weighted UCL could not be calculated for that compound. The mean concentration was used as the EPC.
2 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

TABLE 3.3A.RME
EPCs WEIGHTED 95 PERCENT FOR SOILS WITH NO ASH/BURNT MATERIAL AND 5 PERCENT FOR SOILS WITH ASH/BURNT MATERIAL EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

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

Exposure Point	Chemical of Potential Concern	Units	Weighted Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
OU9	Mercury	mg/kg	0.23	0.25 (N)	8.2	0.25	mg/kg	T-statistic	(1)
	2-Methylnaphthalene	mg/kg	14	17 (N)	560 (J)	17	mg/kg	T-statistic	(1)
	Acenaphthylene	mg/kg	2.7	3.3 (N)	370	3.3	mg/kg	T-statistic	(1)
	Benzo(a)anthracene	mg/kg	4.0	4.7 (N)	410 (J)	4.7	mg/kg	T-statistic	(1)
	Benzo(a)pyrene	mg/kg	4.3	5.0 (N)	450	5.0	mg/kg	T-statistic	(1)
	Benzo(b)fluoranthene	mg/kg	3.5	4.1 (N)	360	4.1	mg/kg	T-statistic	(1)
	Benzo(g,h,i)perylene	mg/kg	2.5	2.9 (N)	230	2.9	mg/kg	T-statistic	(1)
	Benzo(k)fluoranthene	mg/kg	1.5	1.7 (N)	130 (J)	1.7	mg/kg	T-statistic	(1)
	Chrysene	mg/kg	4.0	4.6 (N)	420	4.6	mg/kg	T-statistic	(1)
	Dibenzo(a,h)anthracene	mg/kg	0.77	0.87 (N)	66	0.87	mg/kg	T-statistic	(1)
	Fluoranthene	mg/kg	5.5	6.4 (N)	550	6.4	mg/kg	T-statistic	(1)
	Fluorene	mg/kg	2.5	2.9 (N)	320	2.9	mg/kg	T-statistic	(1)
	Indeno(1,2,3-cd)pyrene	mg/kg	1.7	2.0 (N)	160	2.0	mg/kg	T-statistic	(1)
	Naphthalene	mg/kg	4.0	5.0 (N)	640	5.0	mg/kg	T-statistic	(1)
	Phenanthrene	mg/kg	10	12 (N)	1300	12	mg/kg	T-statistic	(1)
	Pyrene	mg/kg	8.5	9.9 (N)	910 (J)	9.9	mg/kg	T-statistic	(1)

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

1 95% Upper Confidence Limits were calculated on the weighted average concentrations using the T-statistic. The T-statistic was utilized based on the central limit theorem which states that as the size of the data set increases the normal distribution provides an approximation to the sampling distribution of the sample mean. A sample size of roughly 25 to 30 samples is large enough to utilize the normal distribution approximation. (Miller and Freund's Probability and Statistics for Engineers Sixth Edition Richard A Johnson 2000). 95% UCLs presented were used as EPCs when calculating risks.

Exposure point concentrations for the RME scenarios are also the exposure point concentrations for the CTE scenarios.

RAGS TABLES 7 and 9

EPCS unweighted from ProUCL

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
7.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
7.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
7.5.RME	Child Residents - Entire Site Surface/Subsurface Soil
7.6.RME	Adult Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
7.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
7.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
7.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
7.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
7.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	5.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-08	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	9.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-07	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	6.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-09	4.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	8.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-08	5.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	4.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.0E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-07	2.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-09	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.1E-07					--
		Exposure Point Total									1.1E-06					--
	Exposure Medium Total										1.1E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-10	1.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.3E-6	mg/m^3	4.5E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.0E-09	3.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.7E-6	mg/m^3	3.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.8E-10	2.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.1E-7	mg/m^3	4.1E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.9E-10	2.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-6	mg/m^3	2.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-10	1.4E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.4E-09					--
		Exposure Point Total									6.4E-09					--
	Exposure Medium Total										6.4E-09					--
Medium Total											1.1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	5.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	93.0	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.05
				Acenaphthylene	110	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.004
				Benzo(a)anthracene	130	mg/kg	3.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-06	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	3.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-05	2.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-06	2.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
				Benzo(k)fluoranthene	44.0	mg/kg	1.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.9E-08	8.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	3.6E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	6.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-06	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	5.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.009
				Fluorene	97.0	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.005
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-06	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	5.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				Phenanthrene	400	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.03
				Pyrene	290	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
			Exp. Route Total								3.9E-05					0.1

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	7.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-07	8.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	4.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-08	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	5.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-07	4.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.007
				Phenanthrene	400	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	3.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.007
			Exp. Route Total								1.5E-05					0.05
		Exposure Point Total									5.4E-05					0.2
	Exposure Medium Total										5.4E-05					0.2
	Air	OU9	Inhalation	Mercury	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-07	(mg/m^3)	3.5E-05	(mg/m^3)	0.005
				2-Methylnaphthalene	0.007	mg/m^3	1.4E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	4.2E-3	mg/m^3	8.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	9.1E-5	mg/m^3	1.8E-07	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.0E-08	1.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	9.8E-5	mg/m^3	1.9E-07	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.1E-07	1.3E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	7.7E-5	mg/m^3	1.5E-07	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-08	1.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	5.3E-5	mg/m^3	1.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	3.1E-5	mg/m^3	6.0E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-09	4.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	9.1E-5	mg/m^3	1.8E-07	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.0E-09	1.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.8E-08	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.3E-4	mg/m^3	2.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	1.5E-3	mg/m^3	3.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.7E-5	mg/m^3	7.3E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.0E-09	5.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.018	mg/m^3	3.6E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.2E-06	2.5E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.8
				Phenanthrene	2.1E-3	mg/m^3	4.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	2.0E-4	mg/m^3	4.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-05	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.5E-06					0.8
		Exposure Point Total									1.5E-06					0.8
	Exposure Medium Total										1.5E-06					0.8
Medium Total											5.6E-05					1.0
										Total of Receptor Risks Across All Media	5.7E-05				Total of Receptor Hazards Across All Media	1.0

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	7.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-06	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	8.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.4E-08	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	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)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	5.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	6.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	9.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.2E-06	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	7.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.5E-08	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	9.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-07	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	4.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.7E-06					--
		Exposure Point Total									1.9E-05					--
	Exposure Medium Total										1.9E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	2.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.2E-11	8.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	2.6E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.1E-12	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	3.7E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.0E-11					--
		Exposure Point Total									4.0E-11					--
	Exposure Medium Total										4.0E-11					--
Medium Total											1.9E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	7.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.007
				2-Methylnaphthalene	93.0	mg/kg	3.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	110	mg/kg	3.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.002
				Benzo(a)anthracene	130	mg/kg	4.5E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-05	1.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	4.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-04	1.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.8E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	1.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-06	4.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	4.5E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	8.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.9E-05	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	6.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Fluorene	97.0	mg/kg	3.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-05	5.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	6.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.009
				Phenanthrene	400	mg/kg	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.009
			Exp. Route Total								4.9E-04					0.07

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	2.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	110	mg/kg	3.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.002
				Benzo(a)anthracene	130	mg/kg	3.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	4.2E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.1E-04	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	3.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-05	9.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	1.3E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.6E-07	3.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	3.9E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.8E-07	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	6.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-05	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	5.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Fluorene	97.0	mg/kg	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.6E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-05	4.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	5.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.008
				Phenanthrene	400	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Pyrene	290	mg/kg	8.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.008
			Exp. Route Total								4.2E-04					0.05
		Exposure Point Total									9.1E-04					0.1
	Exposure Medium Total										9.1E-04					0.1
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	6.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	1.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-10	3.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	1.2E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-09	3.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	9.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	2.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	6.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	3.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-11	1.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	1.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.2E-11	3.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.4E-10	5.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	4.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.1E-11	1.3E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.8E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	9.7E-06	8.0E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.3
				Phenanthrene	3.5E-4	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.5E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-06					0.3
		Exposure Point Total									9.7E-06					0.3
	Exposure Medium Total										9.7E-06					0.3
Medium Total											9.2E-04					0.4
										Total of Receptor Risks Across All Media	9.4E-04				Total of Receptor Hazards Across All Media	0.4

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-05	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-07	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.1E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.4E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	9.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-05					--
		Exposure Point Total									4.2E-05					--
	Exposure Medium Total										4.2E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	4.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.9E-13	9.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	7.4E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.1E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	5.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-13	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	6.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.0E-13	1.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	3.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-13	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-11					--
		Exposure Point Total									1.0E-11					--
	Exposure Medium Total										1.0E-11					--
Medium Total											4.2E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	3.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	93.0	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.04
				Acenaphthylene	110	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.003
				Benzo(a)anthracene	130	mg/kg	1.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-05	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.2E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.5E-04	2.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	9.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-05	2.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
				Benzo(k)fluoranthene	44.0	mg/kg	3.7E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-06	8.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.1E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.9E-07	2.4E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.008
				Fluorene	97.0	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	4.4E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-05	9.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				Phenanthrene	400	mg/kg	6.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
				Pyrene	290	mg/kg	4.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
			Exp. Route Total								1.2E-03					0.1

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	8.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	110	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.002
				Benzo(a)anthracene	130	mg/kg	7.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-05	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	8.5E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-04	1.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-05	1.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
				Benzo(k)fluoranthene	44.0	mg/kg	2.7E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-06	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.9E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.8E-07	1.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.4E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-04	3.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.006
				Fluorene	97.0	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-05	7.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.01
				Phenanthrene	400	mg/kg	4.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
				Pyrene	290	mg/kg	3.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
			Exp. Route Total								8.6E-04					0.08
		Exposure Point Total									2.0E-03					0.2
	Exposure Medium Total										2.0E-03					0.2
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	8.4E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	5.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	3.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	2.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-11	6.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	3.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.4E-10	6.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	2.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-11	5.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	3.2E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	9.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	2.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	2.9E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.2E-12	6.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	5.1E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.1E-11	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	7.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	1.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	1.4E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	4.6E-07	1.6E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.05
				Phenanthrene	3.5E-4	mg/m^3	1.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	1.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.6E-07					0.05
		Exposure Point Total									4.6E-07					0.05
	Exposure Medium Total										4.6E-07					0.05
Medium Total											2.0E-03					0.3
										Total of Receptor Risks Across All Media	2.1E-03				Total of Receptor Hazards Across All Media	0.3

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3	mg/kg	2.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5	mg/kg	1.6E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.3	mg/kg	1.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-07	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5	mg/kg	9.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					--
			Dermal	Benzo(a)anthracene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-06	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5	mg/kg	1.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-08	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.3	mg/kg	2.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.3E-08	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					--
		Exposure Point Total									3.8E-06					--
	Exposure Medium Total										3.8E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	3.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-13	5.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	5.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.8E-12	8.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	4.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-13	6.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	4.8E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.7E-13	7.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	2.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-13	3.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.4E-12					--
		Exposure Point Total									7.4E-12					--
	Exposure Medium Total										7.4E-12					--
Medium Total											3.8E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2	mg/kg	7.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0007
				2-Methylnaphthalene	93	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	8.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.1E-06	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.5E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44	mg/kg	2.8E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-07	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	8.3E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.1E-08	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	6.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Fluorene	97	mg/kg	3.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	53	mg/kg	3.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.5E-06	5.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	6.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0010
				Phenanthrene	400	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	290	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0010
			Exp. Route Total								9.0E-05					0.008

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.6E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	4.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	8.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.3E-06	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-05	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.3E-06	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44	mg/kg	2.9E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-07	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	8.6E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.3E-08	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	6.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Fluorene	97	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53	mg/kg	3.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-06	5.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	6.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	1.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	290	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								9.3E-05					0.007
		Exposure Point Total									1.8E-04					0.01
	Exposure Medium Total										1.8E-04					0.01
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	1.7E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	6.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	2.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-11	3.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	2.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.5E-10	3.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	1.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-11	2.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	6.6E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	7.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	2.1E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.3E-12	3.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	3.7E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.4E-11	5.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	8.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.3E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.8E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	9.7E-07	8.3E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.03
				Phenanthrene	3.5E-4	mg/m^3	2.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.7E-07					0.03
		Exposure Point Total									9.7E-07					0.03
	Exposure Medium Total										9.7E-07					0.03
Medium Total											1.8E-04					0.04
										Total of Receptor Risks Across All Media	1.9E-04				Total of Receptor Hazards Across All Media	0.04

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-06	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-06	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-05	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	8.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-04					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	4.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-06	9.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	7.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-05	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	5.3E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	6.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.7E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	3.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-06	7.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.2E-05					--
		Exposure Point Total									2.3E-04					--
	Exposure Medium Total										2.3E-04					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	9.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-10	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.4E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	7.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-12	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-10					--
		Exposure Point Total									2.2E-10					--
	Exposure Medium Total										2.2E-10					--
Medium Total											2.3E-04					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.09
				2-Methylnaphthalene	93.0	mg/kg	1.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.3
				Acenaphthylene	110	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-03	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.02
				Benzo(a)anthracene	130	mg/kg	7.6E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.5E-04	1.7E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	8.2E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.0E-03	1.8E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.4E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-04	1.4E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.03
				Benzo(k)fluoranthene	44.0	mg/kg	2.6E-04	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.9E-05	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.6E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.5E-06	1.7E-03	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.3E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-04	2.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.0E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-03	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.06
				Fluorene	97.0	mg/kg	1.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.03
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-04	6.8E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.1E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-03	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.1
				Phenanthrene	400	mg/kg	4.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.2
				Pyrene	290	mg/kg	3.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.1
			Exp. Route Total								8.2E-03					0.9

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	2.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.08
				Acenaphthylene	110	mg/kg	4.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.009
				Benzo(a)anthracene	130	mg/kg	2.8E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-04	6.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	3.0E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-03	6.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.3E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-04	5.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Benzo(k)fluoranthene	44.0	mg/kg	9.4E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.8E-06	2.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.8E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-06	6.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-04	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	7.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.02
				Fluorene	97.0	mg/kg	3.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.01
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.2E-05	2.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	7.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				Phenanthrene	400	mg/kg	1.6E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.06
				Pyrene	290	mg/kg	1.2E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.04
			Exp. Route Total								3.0E-03					0.3
		Exposure Point Total									1.1E-02					1.2
	Exposure Medium Total										1.1E-02					1.2
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	1.8E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-03	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	6.4E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	6.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-10	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	6.5E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.2E-09	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	5.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-10	1.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	6.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	2.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-10	4.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	6.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	6.7E-11	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	1.1E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.3E-09	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	2.5E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-10	5.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	2.9E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	9.8E-06	3.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	1.1
				Phenanthrene	3.5E-4	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.5E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.8E-06					1.1
		Exposure Point Total									9.8E-06					1.1
	Exposure Medium Total										9.8E-06					1.1
Medium Total											1.1E-02					2.3
										Total of Receptor Risks Across All Media	1.1E-02				Total of Receptor Hazards Across All Media	2.3

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-05	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.6E-07	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-06	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.5E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	8.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.5E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.2E-08	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-07	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	6.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.3E-05					--
		Exposure Point Total									3.8E-05					--
	Exposure Medium Total										3.8E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.3E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	2.1E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-10	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-11	2.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.9E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.3E-11	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	9.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.0E-10					--
		Exposure Point Total									3.0E-10					--
	Exposure Medium Total										3.0E-10					--
Medium Total											3.8E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.009
				2-Methylnaphthalene	93.0	mg/kg	4.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.03
				Acenaphthylene	110	mg/kg	5.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.003
				Benzo(a)anthracene	130	mg/kg	1.1E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.2E-05	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.2E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.8E-04	1.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	9.5E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-05	1.5E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	3.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
				Benzo(k)fluoranthene	44.0	0E+00	3.8E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.8E-06	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	1.1E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	8.2E-07	1.8E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	2.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	8.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.006
				Fluorene	97.0	0E+00	4.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	4.6E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-05	7.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	8.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.01
				Phenanthrene	400	0E+00	1.9E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
				Pyrene	290	0E+00	1.4E-04	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
			Exp. Route Total								1.2E-03					0.1

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	2.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	5.8E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-05	9.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	6.3E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-04	9.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	4.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-05	7.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	1.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	0E+00	2.0E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.4E-06	3.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	5.8E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.2E-07	9.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	1.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-05	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	4.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	0E+00	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	2.4E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-05	3.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	4.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.007
				Phenanthrene	400	0E+00	9.7E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.009
				Pyrene	290	0E+00	7.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.007
			Exp. Route Total								6.3E-04					0.04
		Exposure Point Total									1.8E-03					0.1
	Exposure Medium Total										1.8E-03					0.1
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	7.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	4.5E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-03	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	2.6E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	8.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.2E-10	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	9.0E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.9E-09	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	7.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.8E-10	1.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	2.7E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	2.8E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-10	4.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	8.4E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	9.2E-11	1.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	1.5E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.8E-09	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	6.3E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	9.3E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	3.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.8E-10	5.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	1.1E-03	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.9E-05	3.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	1.1
				Phenanthrene	3.5E-4	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	1.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.9E-05					1.1
		Exposure Point Total									3.9E-05					1.1
	Exposure Medium Total										3.9E-05					1.1
Medium Total											1.9E-03					1.3
										Total of Receptor Risks Across All Media	1.9E-03				Total of Receptor Hazards Across All Media	1.3

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-09	7.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	3.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	5.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.3E-08	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	4.5E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.3E-10	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	5.4E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-09	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	2.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-09	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.2E-08					--
		Exposure Point Total									2.5E-07					--
	Exposure Medium Total										2.5E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	9.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.3E-6	mg/m^3	2.3E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.5E-09	1.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.7E-6	mg/m^3	1.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-10	1.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.1E-7	mg/m^3	2.1E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.5E-10	1.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-6	mg/m^3	1.0E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	7.2E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.2E-09					--
		Exposure Point Total									3.2E-09					--
	Exposure Medium Total										3.2E-09					--
Medium Total											2.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	1.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	6.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	7.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0009
				Benzo(a)anthracene	130	mg/kg	9.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.6E-07	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	9.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-06	6.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	7.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-07	5.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	5.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	3.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.2E-08	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	9.0E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.6E-09	6.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.005
				Phenanthrene	400	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
			Exp. Route Total								9.7E-06					0.04

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44.0	mg/kg	7.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.8E-09	5.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.3E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.7E-09	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-07	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	3.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	97.0	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	9.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-08	6.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	290	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.5E-06					0.008
		Exposure Point Total									1.2E-05					0.04
	Exposure Medium Total										1.2E-05					0.04
	Air	OU9	Inhalation	Mercury	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.6E-08	(mg/m^3)	3.5E-05	(mg/m^3)	0.003
				2-Methylnaphthalene	0.007	mg/m^3	7.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	4.2E-3	mg/m^3	4.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	9.1E-5	mg/m^3	8.9E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.8E-09	6.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	9.8E-5	mg/m^3	9.6E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-07	6.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	7.7E-5	mg/m^3	7.5E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.3E-09	5.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	5.3E-5	mg/m^3	5.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	3.1E-5	mg/m^3	3.0E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-09	2.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	9.1E-5	mg/m^3	8.9E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	9.8E-10	6.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.9E-08	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.3E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	1.5E-3	mg/m^3	1.5E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.7E-5	mg/m^3	3.6E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.0E-09	2.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.018	mg/m^3	1.8E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	6.2E-07	1.3E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.4
				Phenanthrene	2.1E-3	mg/m^3	2.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	2.0E-4	mg/m^3	2.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-05	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.7E-07					0.4
		Exposure Point Total									7.7E-07					0.4
	Exposure Medium Total										7.7E-07					0.4
Medium Total											1.3E-05					0.5
										Total of Receptor Risks Across All Media	1.3E-05				Total of Receptor Hazards Across All Media	0.5

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.0E-08	8.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.4E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	8.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.0E-08	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.4E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.7E-09	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-08	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-07					--
		Exposure Point Total									1.9E-06					--
	Exposure Medium Total										1.9E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	5.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.0E-13	4.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	9.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.0E-11	7.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	6.9E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.5E-13	5.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	8.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	9.9E-13	6.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	4.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-13	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-11					--
		Exposure Point Total									1.3E-11					--
	Exposure Medium Total										1.3E-11					--
Medium Total											1.9E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.010
				Acenaphthylene	110	mg/kg	6.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0008
				Benzo(a)anthracene	130	mg/kg	7.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-06	5.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	7.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.6E-05	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-06	4.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	2.4E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.8E-07	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.2E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.2E-08	5.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.3E-06	9.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	9.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	5.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	2.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-06	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.004
				Phenanthrene	400	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								7.8E-05					0.03

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	6.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001
				Acenaphthylene	110	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	130	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.0E-07	9.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.7E-06	1.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-07	8.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	44.0	mg/kg	4.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.0E-08	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.2E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	9.0E-09	9.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	97.0	mg/kg	9.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	5.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-07	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0007
				Phenanthrene	400	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0010
				Pyrene	290	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0007
			Exp. Route Total								1.3E-05					0.005
		Exposure Point Total									9.1E-05					0.04
	Exposure Medium Total										9.1E-05					0.04
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	5.5E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	3.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	2.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	3.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.9E-11	2.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	3.8E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.2E-10	3.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	3.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-11	2.3E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	2.1E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	9.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	3.6E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.9E-12	2.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	6.3E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.6E-11	4.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	4.9E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.8E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	7.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	1.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-11	1.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	9.0E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.1E-06	7.0E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.2
				Phenanthrene	3.5E-4	mg/m^3	8.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	8.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.2E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-06					0.2
		Exposure Point Total									3.1E-06					0.2
	Exposure Medium Total										3.1E-06					0.2
Medium Total											9.4E-05					0.3
										Total of Receptor Risks Across All Media	9.6E-05			Total of Receptor Hazards Across All Media		0.3

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	4.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-07	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	5.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	6.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-08	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-06	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	4.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	9.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.8E-06					--
		Exposure Point Total									7.8E-06					--
	Exposure Medium Total										7.8E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	1.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-13	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-12	4.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-13	3.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.7E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.0E-13	3.7E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	8.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.2E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.6E-12					--
		Exposure Point Total									2.6E-12					--
	Exposure Medium Total										2.6E-12					--
Medium Total											7.8E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	7.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0008
				Benzo(a)anthracene	130	mg/kg	2.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-05	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-04	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	2.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-05	5.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	mg/kg	9.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.7E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	4.8E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	7.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	1.1E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.1E-06	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	7.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.004
				Phenanthrene	400	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								2.9E-04					0.03

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	8.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.5E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	110	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	130	mg/kg	7.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-06	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	8.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-05	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	6.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-06	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	8.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	44.0	mg/kg	2.7E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	7.9E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.8E-08	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.4E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-05	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	97.0	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	3.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-06	7.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	400	mg/kg	4.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	290	mg/kg	3.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								8.6E-05					0.008
		Exposure Point Total									3.8E-04					0.04
	Exposure Medium Total										3.8E-04					0.04
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	2.1E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	7.6E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	7.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.0E-12	1.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	7.8E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.6E-11	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	6.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-12	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	7.9E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	2.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-12	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	7.2E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	8.0E-13	1.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	1.3E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.5E-11	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	2.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	3.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-12	6.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	3.4E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.2E-07	4.0E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.01
				Phenanthrene	3.5E-4	mg/m^3	3.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	3.0E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-07					0.01
		Exposure Point Total									1.2E-07					0.01
	Exposure Medium Total										1.2E-07					0.01
Medium Total											3.8E-04					0.06
										Total of Receptor Risks Across All Media	3.9E-04				Total of Receptor Hazards Across All Media	0.06

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	3.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3E+0	mg/kg	5.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	8.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5E+0	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	4.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-08	7.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5E+0	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.6E-07					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	9.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.3E+0	mg/kg	1.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.5E+0	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.7E-10	1.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	2.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.5E+0	mg/kg	7.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-07					--
		Exposure Point Total									6.0E-07					--
	Exposure Medium Total										6.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	8.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.8E-14	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	1.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-12	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	1.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	1.2E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-13	1.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	6.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-14	9.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-12					--
		Exposure Point Total									1.9E-12					--
	Exposure Medium Total										1.9E-12					--
Medium Total											6.0E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.0E+0	mg/kg	1.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0002
				2-Methylnaphthalene	93.0	mg/kg	8.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0006
				Acenaphthylene	110	mg/kg	9.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00005
				Benzo(a)anthracene	130	mg/kg	2.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-06	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	2.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-05	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	6.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00006
				Benzo(k)fluoranthene	44.0	mg/kg	7.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	2.1E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	3.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-06	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	1.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	97.0	mg/kg	8.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00006
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	8.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.2E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	400	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	290	mg/kg	2.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								2.3E-05					0.002

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.0E+0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0001
				Acenaphthylene	110	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00001
				Benzo(a)anthracene	130	mg/kg	6.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-07	9.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	6.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	5.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-07	8.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00002
				Benzo(k)fluoranthene	44.0	mg/kg	2.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	6.2E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.5E-09	9.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.0E-07	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Fluorene	97.0	mg/kg	2.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	4.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00007
				Phenanthrene	400	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
				Pyrene	290	mg/kg	7.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00007
			Exp. Route Total								6.7E-06					0.0005
		Exposure Point Total									2.9E-05					0.002
	Exposure Medium Total										2.9E-05					0.002
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	4.3E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	2.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	1.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	5.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-12	8.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	5.6E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	6.1E-11	8.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	4.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.8E-12	7.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	1.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	1.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	5.2E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	5.7E-13	8.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	9.2E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-11	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	3.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	5.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	2.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-12	3.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	7.1E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.4E-07	2.1E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.007
				Phenanthrene	3.5E-4	mg/m^3	7.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	6.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-07					0.007
		Exposure Point Total									2.4E-07					0.007
	Exposure Medium Total										2.4E-07					0.007
Medium Total											2.9E-05					0.009
										Total of Receptor Risks Across All Media	3.0E-05				Total of Receptor Hazards Across All Media	0.009

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	8.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.0E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.4E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-07	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-05					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-06	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.9E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-08	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-07	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-07	9.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-06					--
		Exposure Point Total									2.6E-05					--
	Exposure Medium Total										2.6E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	4.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.6E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	3.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.8E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.6E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.9E-11					--
		Exposure Point Total									5.9E-11					--
	Exposure Medium Total										5.9E-11					--
Medium Total											2.6E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	2.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				2-Methylnaphthalene	93.0	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.10
				Acenaphthylene	110	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.008
				Benzo(a)anthracene	130	mg/kg	1.0E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-05	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.1E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.1E-04	6.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	8.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-05	4.7E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	9.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.01
				Benzo(k)fluoranthene	44.0	mg/kg	3.5E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.5E-06	1.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.0E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.5E-07	5.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	1.8E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-04	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.7E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.02
				Fluorene	97.0	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.01
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	4.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-05	2.3E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	2.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.04
				Phenanthrene	400	mg/kg	4.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.06
				Pyrene	290	mg/kg	3.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-03	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.04
			Exp. Route Total								1.1E-03					0.3

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	130	mg/kg	1.5E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-05	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.6E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-04	8.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	mg/kg	1.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-06	6.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	44.0	mg/kg	5.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.7E-07	2.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	mg/kg	1.5E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.1E-07	8.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	mg/kg	2.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-05	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	97.0	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	53.0	mg/kg	6.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-06	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	mg/kg	3.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.006
				Phenanthrene	400	mg/kg	7.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.008
				Pyrene	290	mg/kg	5.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
			Exp. Route Total								1.6E-04					0.04
		Exposure Point Total									1.3E-03					0.4
	Exposure Medium Total										1.3E-03					0.4
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	3.9E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.001	mg/m^3	2.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	1.4E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.0E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	1.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-10	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	1.8E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.0E-09	9.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	7.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	1.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	5.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-11	3.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	1.7E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.8E-11	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	2.9E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-10	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	3.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	5.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	6.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.4E-11	3.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.003	mg/m^3	6.4E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.2E-06	2.2E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.7
				Phenanthrene	3.5E-4	mg/m^3	6.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	5.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-06					0.7
		Exposure Point Total									2.2E-06					0.7
	Exposure Medium Total										2.2E-06					0.7
Medium Total											1.3E-03					1.1
										Total of Receptor Risks Across All Media	1.3E-03				Total of Receptor Hazards Across All Media	1.1

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	2.00	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	9.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	1.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	2.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-07	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.9E-08	6.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-06					--
			Dermal	Benzo(a)anthracene	2.00	mg/kg	2.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	3.30	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-07	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	2.50	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.9E-09	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.300	mg/kg	3.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	1.50	mg/kg	1.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.1E-07					--
		Exposure Point Total									2.4E-06					--
	Exposure Medium Total										2.4E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	2.1E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-10	mg/m^3	3.5E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.9E-11	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	2.7E-10	mg/m^3	2.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.2E-11	mg/m^3	3.2E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.9E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.6E-10	mg/m^3	1.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.0E-11					--
		Exposure Point Total									5.0E-11					--
	Exposure Medium Total										5.0E-11					--
Medium Total											2.4E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Mercury	2.00	mg/kg	9.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	93.0	mg/kg	4.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	110	mg/kg	5.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0008
				Benzo(a)anthracene	130	mg/kg	9.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.8E-06	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.4E-05	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	7.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-06	5.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	44.0	0E+00	3.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.3E-07	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	9.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.8E-08	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	8.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	97.0	0E+00	4.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	3.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-06	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	8.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.004
				Phenanthrene	400	0E+00	1.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Pyrene	290	0E+00	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								1.0E-04					0.03

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Mercury	2.00	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	93.0	mg/kg	4.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.001
				Acenaphthylene	110	mg/kg	7.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	130	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	8.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	140	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	9.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	110	0E+00	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-07	7.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	76.0	0E+00	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	44.0	0E+00	4.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.4E-08	3.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	130	0E+00	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	8.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	23.0	0E+00	2.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	180	0E+00	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	97.0	0E+00	6.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	53.0	0E+00	5.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.1E-07	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	190	0E+00	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	400	0E+00	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Pyrene	290	0E+00	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0007
			Exp. Route Total								1.5E-05					0.004
		Exposure Point Total									1.2E-04					0.04
	Exposure Medium Total										1.2E-04					0.04
	Air	OU9	Inhalation	Mercury	2.1E-10	mg/m^3	1.4E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	1.4E-03	mg/m^3	8.7E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	7.8E-4	mg/m^3	5.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.0E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.4E-8	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.5E-8	mg/m^3	1.5E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-09	9.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.2E-8	mg/m^3	1.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-10	7.5E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	8.1E-9	mg/m^3	5.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.7E-9	mg/m^3	4.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.2E-11	3.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.4E-8	mg/m^3	1.4E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.5E-11	8.9E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	2.5E-9	mg/m^3	2.5E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.0E-10	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	1.9E-8	mg/m^3	1.2E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.8E-4	mg/m^3	1.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	5.7E-9	mg/m^3	5.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.3E-11	3.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	3.5E-03	mg/m^3	2.2E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	7.6E-06	2.2E-03	(mg/m^3)	3.0E-03	(mg/m^3)	0.7
				Phenanthrene	3.5E-4	mg/m^3	2.2E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.1E-8	mg/m^3	2.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.6E-06					0.7
		Exposure Point Total									7.6E-06					0.7
	Exposure Medium Total										7.6E-06					0.7
Medium Total											1.2E-04					0.8
										Total of Receptor Risks Across All Media	1.3E-04				Total of Receptor Hazards Across All Media	0.8

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface/Subsurface Soil
9.6.RME	Child Residents - Entire Site Surface/Subsurface Soil
9.7.RME	Adult Residents - Entire Site Surface/Subsurface Soil
9.8.RME	Lifetime Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
9.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Benzo(a)pyrene	7E-07	--	3E-07	--	9E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	5E-09	--	2E-09	--	7E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	2E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	8E-07	--	3E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-09	--	--	5E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-10	--	--	5E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Chemical Total	--	6E-09	--	--	6E-09		- -	--	- -	--
		Exposure Point Total						6E-09					--
	Exposure Medium Total							6E-09					--
Medium Total								1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.05	- -	0.01	0.06
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.004	- -	0.001	0.005
			Benzo(a)anthracene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	4E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	9E-07	--	3E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.005	- -	0.002	0.007
			Benzo(k)fluoranthene	9E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	2E-06	--	6E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.009	- -	0.003	0.01
			Fluorene	- -	--	- -	--	- -	Blood	0.005	- -	0.002	0.007
			Indeno(1,2,3-cd)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.02	- -	0.007	0.03
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.03	- -	0.01	0.04
			Pyrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.007	0.03
			Chemical Total	4E-05	--	2E-05	--	5E-05		0.1	--	0.05	0.2
		Exposure Point Total						5E-05					0.2
	Exposure Medium Total							5E-05					0.2

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	0.005	- -	0.005
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-07	--	--	2E-07	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Chrysene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-08	--	--	4E-08	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.8	- -	0.8
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.8	- -	0.8
		Exposure Point Total						2E-06					0.8
	Exposure Medium Total							2E-06					0.8
Medium Total								6E-05					1
Receptor Total							Receptor Risk Total	6E-05				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.01
Total Blood HI	0.01
Total Body Weight HI	0.03
Total Kidney HI	0.06
Total Liver HI	0.02
Total Lungs HI	0.06
Total Nasal HI	0.8

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	8E-06	--	7E-06	--	2E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	6E-08	--	5E-08	--	1E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	7E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	4E-07	--	3E-07	--	7E-07	NA	--	- -	--	--
			Chemical Total	1E-05	--	9E-06	--	2E-05		--	--	--	--
		Exposure Point Total						2E-05					--
	Exposure Medium Total							2E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Chemical Total	--	4E-11	--	--	4E-11		- -	--	- -	--
		Exposure Point Total						4E-11					--
	Exposure Medium Total							4E-11					--
Medium Total								2E-05					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.007	- -	--	0.007
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.02	- -	0.02	0.04
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.002	- -	0.002	0.003
			Benzo(a)anthracene	3E-05	--	3E-05	--	6E-05	NA	--	- -	--	--
			Benzo(a)pyrene	4E-04	--	3E-04	--	7E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.002	- -	0.002	0.005
			Benzo(k)fluoranthene	1E-06	--	1E-06	--	2E-06	NA	--	- -	--	--
			Chrysene	3E-07	--	3E-07	--	6E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-05	--	5E-05	--	1E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.004	- -	0.004	0.008
			Fluorene	- -	--	- -	--	- -	Blood	0.002	- -	0.002	0.004
			Indeno(1,2,3-cd)pyrene	1E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.009	- -	0.008	0.02
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.01	- -	0.01	0.02
			Pyrene	- -	--	- -	--	- -	Kidney	0.009	- -	0.008	0.02
			Chemical Total	5E-04	--	4E-04	--	9E-04		0.07	--	0.05	0.1
		Exposure Point Total						9E-04					0.1
	Exposure Medium Total							9E-04					0.1

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Chrysene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Naphthalene	--	1E-05	--	--	1E-05	Nasal	- -	0.3	- -	0.3
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-05	--	--	1E-05		- -	0.3	- -	0.3
		Exposure Point Total						1E-05					0.3
	Exposure Medium Total							1E-05					0.3
Medium Total								9E-04					0.4
Receptor Total							Receptor Risk Total	9E-04				Receptor HI Total	0.4

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.007
Total Blood HI	0.008
Total Body Weight HI	0.02
Total Kidney HI	0.04
Total Liver HI	0.01
Total Lungs HI	0.04
Total Nasal HI	0.3

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-07	--	1E-07	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	7E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	2E-05	--	2E-05	--	4E-05		--	--	--	--
		Exposure Point Total						4E-05					--
	Exposure Medium Total							4E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								4E-05					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.04	- -	0.02	0.07
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.003	- -	0.002	0.006
			Benzo(a)anthracene	8E-05	--	6E-05	--	1E-04	NA	--	- -	--	--
			Benzo(a)pyrene	9E-04	--	6E-04	--	1E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	7E-05	--	5E-05	--	1E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.005	- -	0.003	0.008
			Benzo(k)fluoranthene	3E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Chrysene	8E-07	--	6E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-04	--	1E-04	--	2E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.008	- -	0.006	0.01
			Fluorene	- -	--	- -	--	- -	Blood	0.004	- -	0.003	0.008
			Indeno(1,2,3-cd)pyrene	3E-05	--	2E-05	--	6E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.02	- -	0.01	0.03
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.02	0.04
			Pyrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.01	0.03
			Chemical Total	1E-03	--	9E-04	--	2E-03		0.1	--	0.08	0.2
		Exposure Point Total						2E-03					0.2
	Exposure Medium Total							2E-03					0.2

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	5E-07	--	--	5E-07	Nasal	- -	0.05	- -	0.05
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	5E-07	--	--	5E-07		- -	0.05	- -	0.05
		Exposure Point Total						5E-07					0.05
	Exposure Medium Total							5E-07					0.05
Medium Total								2E-03					0.3
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	0.3

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.01
Total Blood HI	0.01
Total Body Weight HI	0.03
Total Kidney HI	0.07
Total Liver HI	0.02
Total Lungs HI	0.07
Total Nasal HI	0.05

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	9E-08	--	1E-07	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	3E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	1E-08	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	1E-07	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-08	--	7E-08	--	1E-07	NA	--	- -	--	--
			Chemical Total	2E-06	--	2E-06	--	4E-06		--	--	--	--
		Exposure Point Total						4E-06					--
	Exposure Medium Total							4E-06					--
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Chemical Total	--	7E-12	--	--	7E-12		- -	--	- -	--
		Exposure Point Total						7E-12					--
	Exposure Medium Total							7E-12					--
Medium Total								4E-06					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.0007	- -	--	0.0007
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	- -	0.002	0.004
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0002	- -	0.0002	0.0004
			Benzo(a)anthracene	6E-06	--	6E-06	--	1E-05	NA	--	- -	--	--
			Benzo(a)pyrene	7E-05	--	7E-05	--	1E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	5E-06	--	5E-06	--	1E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0003	0.0005
			Benzo(k)fluoranthene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chrysene	6E-08	--	6E-08	--	1E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	1E-05	--	2E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0005	- -	0.0005	0.0009
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.0003	0.0005
			Indeno(1,2,3-cd)pyrene	2E-06	--	3E-06	--	5E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0010	- -	0.001	0.002
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.001	- -	0.001	0.003
			Pyrene	- -	--	- -	--	- -	Kidney	0.0010	- -	0.001	0.002
			Chemical Total	9E-05	--	9E-05	--	2E-04		0.008	--	0.007	0.01
		Exposure Point Total						2E-04					0.01
	Exposure Medium Total							2E-04					0.01

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Chrysene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.03	- -	0.03
		Exposure Point Total						1E-06					0.03
	Exposure Medium Total							1E-06					0.03
Medium Total								2E-04					0.04
Receptor Total							Receptor Risk Total	2E-04				Receptor HI Total	0.04

Total Blood HI	0.0009
Total Body Weight HI	0.002
Total Kidney HI	0.005
Total Liver HI	0.001
Total Lungs HI	0.004
Total Nasal HI	0.03

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	1E-06	--	1E-06	--	2E-06
			Benzo(a)pyrene	2E-05	--	2E-05	--	4E-05
			Benzo(k)fluoranthene	2E-07	--	1E-07	--	3E-07
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06
			Indeno(1,2,3-cd)pyrene	1E-06	--	7E-07	--	2E-06
			Chemical Total	3E-05	--	2E-05	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
	Air	OU9	Benzo(a)anthracene	--	8E-13	--	--	8E-13
			Benzo(a)pyrene	--	1E-11	--	--	1E-11
			Benzo(k)fluoranthene	--	1E-12	--	--	1E-12
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13
			Chemical Total	--	2E-11	--	--	2E-11
		Exposure Point Total						2E-11
	Exposure Medium Total							2E-11
Medium Total								5E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	9E-05	--	6E-05	--	1E-04
			Benzo(a)pyrene	9E-04	--	7E-04	--	2E-03
			Benzo(b)fluoranthene	7E-05	--	5E-05	--	1E-04
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	3E-06	--	2E-06	--	5E-06
			Chrysene	9E-07	--	6E-07	--	1E-06
			Dibenzo(a,h)anthracene	2E-04	--	1E-04	--	3E-04
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	3E-05	--	3E-05	--	6E-05
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	1E-03	--	9E-04	--	2E-03
		Exposure Point Total						2E-03
	Exposure Medium Total							2E-03

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	5E-11	--	--	5E-11
			Benzo(a)pyrene	--	6E-10	--	--	6E-10
			Benzo(b)fluoranthene	--	5E-11	--	--	5E-11
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11
			Chrysene	--	5E-12	--	--	5E-12
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11
			Naphthalene	--	1E-06	--	--	1E-06
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	1E-06	--	--	1E-06
		Exposure Point Total						1E-06
	Exposure Medium Total							1E-06
Medium Total								2E-03
Receptor Total							Receptor Risk Total	2E-03

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	9E-06	--	3E-06	--	1E-05	NA	--	- -	--	--
			Benzo(a)pyrene	1E-04	--	5E-05	--	2E-04	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Chemical Total	2E-04	--	6E-05	--	2E-04		--	--	--	--
		Exposure Point Total						2E-04					--
	Exposure Medium Total							2E-04					--
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Chemical Total	--	2E-10	--	--	2E-10		- -	--	- -	--
		Exposure Point Total						2E-10					--
	Exposure Medium Total							2E-10					--
Medium Total								2E-04					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.09	- -	--	0.09
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.3	- -	0.08	0.4
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.02	- -	0.009	0.03
			Benzo(a)anthracene	6E-04	--	2E-04	--	8E-04	NA	--	- -	--	--
			Benzo(a)pyrene	6E-03	--	2E-03	--	8E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	5E-04	--	2E-04	--	6E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.03	- -	0.01	0.04
			Benzo(k)fluoranthene	2E-05	--	7E-06	--	3E-05	NA	--	- -	--	--
			Chrysene	6E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-03	--	4E-04	--	1E-03	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.06	- -	0.02	0.08
			Fluorene	- -	--	- -	--	- -	Blood	0.03	- -	0.01	0.04
			Indeno(1,2,3-cd)pyrene	2E-04	--	8E-05	--	3E-04	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.1	- -	0.04	0.2
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.2	- -	0.06	0.2
			Pyrene	- -	--	- -	--	- -	Kidney	0.1	- -	0.04	0.2
			Chemical Total	8E-03	--	3E-03	--	1E-02		0.9	--	0.3	1
		Exposure Point Total						1E-02					1
	Exposure Medium Total							1E-02					1

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Chrysene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Naphthalene	--	1E-05	--	--	1E-05	Nasal	- -	1	- -	1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-05	--	--	1E-05		- -	1	- -	1
		Exposure Point Total						1E-05					1
	Exposure Medium Total							1E-05					1
Medium Total								1E-02					2
Receptor Total							Receptor Risk Total	1E-02				Receptor HI Total	2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.09
Total Blood HI	0.07
Total Body Weight HI	0.2
Total Kidney HI	0.4
Total Liver HI	0.1
Total Lungs HI	0.4
Total Nasal HI	1

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	1E-05	--	3E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-07	--	8E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	1E-06	--	3E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	5E-07	--	1E-06	NA	--	- -	--	--
			Chemical Total	2E-05	--	1E-05	--	4E-05		--	--	--	--
		Exposure Point Total						4E-05					--
	Exposure Medium Total							4E-05					--
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chemical Total	--	3E-10	--	--	3E-10		- -	--	- -	--
		Exposure Point Total						3E-10					--
	Exposure Medium Total							3E-10					--
Medium Total								4E-05					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.009	- -	--	0.009
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.03	- -	0.01	0.04
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.003	- -	0.001	0.004
			Benzo(a)anthracene	8E-05	--	4E-05	--	1E-04	NA	--	- -	--	--
			Benzo(a)pyrene	9E-04	--	5E-04	--	1E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	7E-05	--	4E-05	--	1E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.003	- -	0.002	0.005
			Benzo(k)fluoranthene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Chrysene	8E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-04	--	7E-05	--	2E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.006	- -	0.003	0.009
			Fluorene	- -	--	- -	--	- -	Blood	0.003	- -	0.002	0.005
			Indeno(1,2,3-cd)pyrene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.01	- -	0.007	0.02
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.009	0.03
			Pyrene	- -	--	- -	--	- -	Kidney	0.01	- -	0.007	0.02
			Chemical Total	1E-03	--	6E-04	--	2E-03		0.1	--	0.04	0.1
		Exposure Point Total						2E-03					0.1
	Exposure Medium Total							2E-03					0.1

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	9E-10	--	--	9E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-08	--	--	1E-08	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	8E-10	--	--	8E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Chrysene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Naphthalene	--	4E-05	--	--	4E-05	Nasal	- -	1	- -	1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-05	--	--	4E-05		- -	1	- -	1
		Exposure Point Total						4E-05					1
	Exposure Medium Total							4E-05					1
Medium Total								2E-03					1
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.009
Total Blood HI	0.009
Total Body Weight HI	0.02
Total Kidney HI	0.05
Total Liver HI	0.01
Total Lungs HI	0.04
Total Nasal HI	1

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	1E-05	--	4E-06	--	1E-05
			Benzo(a)pyrene	2E-04	--	6E-05	--	2E-04
			Benzo(k)fluoranthene	1E-06	--	5E-07	--	2E-06
			Dibenzo(a,h)anthracene	1E-05	--	6E-06	--	2E-05
			Indeno(1,2,3-cd)pyrene	7E-06	--	3E-06	--	1E-05
			Chemical Total	2E-04	--	7E-05	--	3E-04
		Exposure Point Total						3E-04
	Exposure Medium Total							3E-04
	Air	OU9	Benzo(a)anthracene	--	2E-11	--	--	2E-11
			Benzo(a)pyrene	--	4E-10	--	--	4E-10
			Benzo(k)fluoranthene	--	3E-11	--	--	3E-11
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11
			Chemical Total	--	5E-10	--	--	5E-10
		Exposure Point Total						5E-10
	Exposure Medium Total							5E-10
Medium Total								3E-04

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	6E-04	--	2E-04	--	9E-04
			Benzo(a)pyrene	7E-03	--	3E-03	--	9E-03
			Benzo(b)fluoranthene	5E-04	--	2E-04	--	7E-04
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	2E-05	--	8E-06	--	3E-05
			Chrysene	6E-06	--	2E-06	--	9E-06
			Dibenzo(a,h)anthracene	1E-03	--	4E-04	--	2E-03
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	3E-04	--	1E-04	--	4E-04
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	9E-03	--	4E-03	--	1E-02
		Exposure Point Total						1E-02
	Exposure Medium Total							1E-02

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	2E-09	--	--	2E-09
			Benzo(a)pyrene	--	2E-08	--	--	2E-08
			Benzo(b)fluoranthene	--	1E-09	--	--	1E-09
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	5E-10	--	--	5E-10
			Chrysene	--	2E-10	--	--	2E-10
			Dibenzo(a,h)anthracene	--	3E-09	--	--	3E-09
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	6E-10	--	--	6E-10
			Naphthalene	--	5E-05	--	--	5E-05
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	5E-05	--	--	5E-05
		Exposure Point Total						5E-05
	Exposure Medium Total							5E-05
Medium Total								1E-02
Receptor Total							Receptor Risk Total	1E-02

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	4E-08	--	2E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	3E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	8E-09	--	2E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	5E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Chemical Total	--	3E-09	--	--	3E-09		- -	--	- -	--
		Exposure Point Total						3E-09					--
	Exposure Medium Total							3E-09					--
Medium Total								3E-07					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0009	- -	0.0002	0.001
			Benzo(a)anthracene	7E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	7E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-07	--	1E-07	--	7E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0003	0.002
			Benzo(k)fluoranthene	2E-08	--	6E-09	--	3E-08	NA	--	- -	--	--
			Chrysene	7E-09	--	2E-09	--	8E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	3E-07	--	1E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	3E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.005	- -	0.001	0.006
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.002	0.008
			Pyrene	- -	--	- -	--	- -	Kidney	0.005	- -	0.001	0.006
			Chemical Total	1E-05	--	3E-06	--	1E-05		0.04	--	0.008	0.04
		Exposure Point Total						1E-05					0.04
	Exposure Medium Total							1E-05					0.04

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	0.003	- -	0.003
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-08	--	--	1E-08	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-07	--	--	1E-07	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Chrysene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Naphthalene	--	6E-07	--	--	6E-07	Nasal	- -	0.4	- -	0.4
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	8E-07	--	--	8E-07		- -	0.4	- -	0.4
		Exposure Point Total						8E-07					0.4
	Exposure Medium Total							8E-07					0.4
Medium Total								1E-05					0.5
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	0.5

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.003
Total Body Weight HI	0.006
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.4

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	2E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	2E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-08	--	1E-08	--	7E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	3E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								2E-06					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.010	- -	0.001	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0008	- -	0.0001	0.0009
			Benzo(a)anthracene	5E-06	--	9E-07	--	6E-06	NA	--	- -	--	--
			Benzo(a)pyrene	6E-05	--	1E-05	--	7E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	4E-06	--	8E-07	--	5E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0002	0.001
			Benzo(k)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	5E-08	--	9E-09	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	9E-06	--	2E-06	--	1E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0003	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0002	0.001
			Indeno(1,2,3-cd)pyrene	2E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.004	- -	0.0007	0.005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.0010	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.0007	0.005
			Chemical Total	8E-05	--	1E-05	--	9E-05		0.03	--	0.005	0.04
		Exposure Point Total						9E-05					0.04
	Exposure Medium Total							9E-05					0.04

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-11	--	--	8E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Naphthalene	--	3E-06	--	--	3E-06	Nasal	- -	0.2	- -	0.2
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-06	--	--	3E-06		- -	0.2	- -	0.2
		Exposure Point Total						3E-06					0.2
	Exposure Medium Total							3E-06					0.2
Medium Total								9E-05					0.3
Receptor Total							Receptor Risk Total	1E-04				Receptor HI Total	0.3

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.002
Total Body Weight HI	0.005
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.2

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	3E-07	--	9E-08	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	1E-06	--	6E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-07	--	1E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	2E-06	--	8E-06		--	--	--	--
		Exposure Point Total						8E-06					--
	Exposure Medium Total							8E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								8E-06					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0008	- -	0.0002	0.001
			Benzo(a)anthracene	2E-05	--	6E-06	--	3E-05	NA	--	- -	--	--
			Benzo(a)pyrene	2E-04	--	6E-05	--	3E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0003	0.001
			Benzo(k)fluoranthene	7E-07	--	2E-07	--	9E-07	NA	--	- -	--	--
			Chrysene	2E-07	--	6E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	8E-06	--	2E-06	--	1E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.004	- -	0.001	0.006
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.002	0.008
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.001	0.006
			Chemical Total	3E-04	--	9E-05	--	4E-04		0.03	--	0.008	0.04
		Exposure Point Total						4E-04					0.04
	Exposure Medium Total							4E-04					0.04

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chrysene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Naphthalene	--	1E-07	--	--	1E-07	Nasal	- -	0.01	- -	0.01
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.01	- -	0.01
		Exposure Point Total						1E-07					0.01
	Exposure Medium Total							1E-07					0.01
Medium Total								4E-04					0.06
Receptor Total							Receptor Risk Total	4E-04				Receptor HI Total	0.06

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.003
Total Body Weight HI	0.006
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.01

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	1E-07	--	5E-07	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	9E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	5E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	1E-07	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-07					--
	Air	OU9	Benzo(a)anthracene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-14	--	--	7E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.0002	- -	--	0.0002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0006	- -	0.0001	0.0007
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00005	- -	0.00001	0.00006
			Benzo(a)anthracene	2E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	5E-06	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00006	- -	0.00002	0.00008
			Benzo(k)fluoranthene	5E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Chrysene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-06	--	8E-07	--	3E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0001	- -	0.00003	0.0001
			Fluorene	- -	--	- -	--	- -	Blood	0.00006	- -	0.00002	0.00008
			Indeno(1,2,3-cd)pyrene	6E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0002	- -	0.00007	0.0003
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0003	- -	0.0001	0.0004
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00007	0.0003
			Chemical Total	2E-05	--	7E-06	--	3E-05		0.002	--	0.0005	0.002
		Exposure Point Total						3E-05					0.002
	Exposure Medium Total							3E-05					0.002

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	2E-07	--	--	2E-07	Nasal	- -	0.007	- -	0.007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.007	- -	0.007
		Exposure Point Total						2E-07					0.007
	Exposure Medium Total							2E-07					0.007
Medium Total								3E-05					0.009
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	0.009

Total Blood HI	0.0001
Total Body Weight HI	0.0003
Total Kidney HI	0.0008
Total Liver HI	0.0002
Total Lungs HI	0.0007
Total Nasal HI	0.007

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-06	--	2E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	2E-05	--	3E-06	--	2E-05	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-07	--	1E-07	--	1E-06	NA	--	- -	--	--
			Chemical Total	2E-05	--	3E-06	--	3E-05		--	--	--	--
		Exposure Point Total						3E-05					--
	Exposure Medium Total							3E-05					--
	Air	OU9	Benzo(a)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								3E-05					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.03	- -	--	0.03
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.10	- -	0.01	0.1
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.008	- -	0.001	0.009
			Benzo(a)anthracene	8E-05	--	1E-05	--	9E-05	NA	--	- -	--	--
			Benzo(a)pyrene	8E-04	--	1E-04	--	9E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-05	--	9E-06	--	7E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.01	- -	0.002	0.01
			Benzo(k)fluoranthene	3E-06	--	4E-07	--	3E-06	NA	--	- -	--	--
			Chrysene	8E-07	--	1E-07	--	9E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-04	--	2E-05	--	2E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.02	- -	0.003	0.02
			Fluorene	- -	--	- -	--	- -	Blood	0.01	- -	0.002	0.01
			Indeno(1,2,3-cd)pyrene	3E-05	--	4E-06	--	4E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.04	- -	0.006	0.05
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.06	- -	0.008	0.07
			Pyrene	- -	--	- -	--	- -	Kidney	0.04	- -	0.006	0.05
			Chemical Total	1E-03	--	2E-04	--	1E-03		0.3	--	0.04	0.4
		Exposure Point Total						1E-03					0.4
	Exposure Medium Total							1E-03					0.4

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chrysene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Naphthalene	--	2E-06	--	--	2E-06	Nasal	- -	0.7	- -	0.7
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-06	--	--	2E-06		- -	0.7	- -	0.7
		Exposure Point Total						2E-06					0.7
	Exposure Medium Total							2E-06					0.7
Medium Total								1E-03					1
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.03
Total Blood HI	0.02
Total Body Weight HI	0.05
Total Kidney HI	0.1
Total Liver HI	0.03
Total Lungs HI	0.1
Total Nasal HI	0.7

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	2E-09	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	3E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	5E-11	--	--	5E-11		- -	--	- -	--
		Exposure Point Total						5E-11					--
	Exposure Medium Total							5E-11					--
Medium Total								2E-06					--
Subsurface Soil	Subsurface Soil	OU9	Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.001	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0008	- -	0.0001	0.0010
			Benzo(a)anthracene	7E-06	--	1E-06	--	8E-06	NA	--	- -	--	--
			Benzo(a)pyrene	7E-05	--	1E-05	--	8E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-06	--	9E-07	--	7E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0002	0.001
			Benzo(k)fluoranthene	2E-07	--	3E-08	--	3E-07	NA	--	- -	--	--
			Chrysene	7E-08	--	1E-08	--	8E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	2E-06	--	1E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0003	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.001	- -	0.0002	0.001
			Indeno(1,2,3-cd)pyrene	3E-06	--	4E-07	--	3E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.004	- -	0.0006	0.005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.006	- -	0.0009	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.0007	0.005
			Chemical Total	1E-04	--	2E-05	--	1E-04		0.03	--	0.004	0.04
		Exposure Point Total						1E-04					0.04
	Exposure Medium Total							1E-04					0.04

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Chrysene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Naphthalene	--	8E-06	--	--	8E-06	Nasal	- -	0.7	- -	0.7
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	8E-06	--	--	8E-06		- -	0.7	- -	0.7
		Exposure Point Total						8E-06					0.7
	Exposure Medium Total							8E-06					0.7
Medium Total								1E-04					0.8
Receptor Total							Receptor Risk Total	1E-04				Receptor HI Total	0.8

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.002
Total Body Weight HI	0.005
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.01
Total Nasal HI	0.7

RAGS TABLES 7 and 9

EPCS Weighted 90% Excavated Area 10% Unexcavated Area

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
7.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
7.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
7.5.RME	Child Residents - Entire Site Surface/Subsurface Soil
7.6.RME	Adult Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
7.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
7.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
7.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
7.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
7.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	3.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-08	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-07	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-09	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	4.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-08	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-09	8.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.6E-07					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-09	8.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-08	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	7.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.7E-10	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-09	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-07					--
		Exposure Point Total									3.6E-07					--
	Exposure Medium Total										3.6E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	7.7E-7	mg/m^3	1.5E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-10	1.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	6.6E-7	mg/m^3	1.3E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-09	9.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.0E-7	mg/m^3	9.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	6.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.1E-7	mg/m^3	2.2E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.6E-10	1.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.1E-7	mg/m^3	6.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-11	4.2E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-09					--
		Exposure Point Total									2.0E-09					--
	Exposure Medium Total										2.0E-09					--
Medium Total											3.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	2.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				2-Methylnaphthalene	32.0	mg/kg	8.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	17	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0005
				Benzo(a)anthracene	23	mg/kg	6.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.6E-07	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-06	4.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	5.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-07	3.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	3.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Benzo(k)fluoranthene	8.2	mg/kg	2.3E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.7E-08	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	6.4E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.6E-09	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	1.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.7E-07	8.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	8.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	15.0	mg/kg	4.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.003
				Phenanthrene	64	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
				Pyrene	51	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
			Exp. Route Total								7.0E-06					0.03

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	3.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-08	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-07	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-09	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	4.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-08	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-09	8.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.6E-07					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-09	8.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-08	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	7.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.7E-10	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-09	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.0E-07					--
		Exposure Point Total									3.6E-07					--
	Exposure Medium Total										3.6E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	7.7E-7	mg/m^3	1.5E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-10	1.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	6.6E-7	mg/m^3	1.3E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-09	9.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.0E-7	mg/m^3	9.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-10	6.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.1E-7	mg/m^3	2.2E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.6E-10	1.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.1E-7	mg/m^3	6.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-11	4.2E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-09					--
		Exposure Point Total									2.0E-09					--
	Exposure Medium Total										2.0E-09					--
Medium Total											3.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	2.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				2-Methylnaphthalene	32.0	mg/kg	8.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	17	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0005
				Benzo(a)anthracene	23	mg/kg	6.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.6E-07	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-06	4.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	5.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-07	3.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	3.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Benzo(k)fluoranthene	8.2	mg/kg	2.3E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.7E-08	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	6.4E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	4.6E-09	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	1.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.7E-07	8.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	8.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	15.0	mg/kg	4.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	7.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.003
				Phenanthrene	64	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
				Pyrene	51	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
			Exp. Route Total								7.0E-06					0.03

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32.0	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.005
				Acenaphthylene	17	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	23	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	2.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
				Benzo(k)fluoranthene	8.2	mg/kg	8.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.5E-09	6.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	2.5E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.8E-09	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	4.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.4E-07	3.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	15.0	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-08	7.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0010
				Phenanthrene	64	mg/kg	6.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	51	mg/kg	5.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.7E-06					0.010
		Exposure Point Total									9.7E-06					0.04
	Exposure Medium Total										9.7E-06					0.04
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	5.7E-7	mg/m^3	1.1E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-03	mg/m^3	4.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	6.4E-4	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.8E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-09	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.7E-5	mg/m^3	3.4E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.8E-08	2.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.4E-5	mg/m^3	2.7E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-09	1.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	9.8E-6	mg/m^3	1.9E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.7E-6	mg/m^3	1.1E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-09	7.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.6E-5	mg/m^3	3.1E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.5E-10	2.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.0E-6	mg/m^3	5.9E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.1E-09	4.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	2.2E-5	mg/m^3	4.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.5E-4	mg/m^3	4.9E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	6.7E-6	mg/m^3	1.3E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-09	9.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	2.5E-03	mg/m^3	5.0E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.7E-07	3.5E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.1
				Phenanthrene	1.9E-3	mg/m^3	3.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.6E-5	mg/m^3	7.0E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.9E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-07					0.1
		Exposure Point Total									2.2E-07					0.1
	Exposure Medium Total										2.2E-07					0.1
Medium Total											1.0E-05					0.2
										Total of Receptor Risks Across All Media	1.0E-05				Total of Receptor Hazards Across All Media	0.2

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	3.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-07	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	3.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-06	9.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.8E-08	7.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	5.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-07	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.2E-06					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	3.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-07	9.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-06	8.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	2.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.6E-08	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.6E-08	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.8E-06					--
		Exposure Point Total									6.0E-06					--
	Exposure Medium Total										6.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	9.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-12	2.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	8.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.1E-12	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	6.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.9E-13	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	1.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-12	3.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	3.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-13	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-11					--
		Exposure Point Total									1.3E-11					--
	Exposure Medium Total										1.3E-11					--
Medium Total											6.0E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	2.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.003
				2-Methylnaphthalene	32	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.008
				Acenaphthylene	17	mg/kg	5.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0003
				Benzo(a)anthracene	23	mg/kg	8.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.9E-06	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	8.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.4E-05	2.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	7.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-06	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	4.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0005
				Benzo(k)fluoranthene	8.2	mg/kg	2.9E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-07	8.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	8.0E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.9E-08	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0008
				Fluorene	15	mg/kg	5.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0004
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	3.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-06	9.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	9.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	64	mg/kg	2.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	51	mg/kg	1.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
			Exp. Route Total								8.8E-05					0.02

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	7.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.005
				Acenaphthylene	17	mg/kg	5.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	23	mg/kg	6.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.0E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	7.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-05	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	6.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-06	1.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
				Benzo(k)fluoranthene	8.2	mg/kg	2.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.8E-07	6.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	6.9E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.0E-08	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	1.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.4E-06	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	9.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Fluorene	15	mg/kg	4.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	2.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-06	8.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	7.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	64	mg/kg	1.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	51	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								7.6E-05					0.01
		Exposure Point Total									1.6E-04					0.03
	Exposure Medium Total										1.6E-04					0.03
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	7.1E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	3.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	9.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-11	5.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	2.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.4E-10	6.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	1.7E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-11	4.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	1.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	7.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.8E-12	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	2.0E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.2E-12	5.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	3.7E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.5E-11	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	2.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	3.7E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	8.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.2E-12	2.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	3.9E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.3E-06	1.1E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.04
				Phenanthrene	3.5E-4	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	4.4E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-06					0.04
		Exposure Point Total									1.3E-06					0.04
	Exposure Medium Total										1.3E-06					0.04
Medium Total											1.7E-04					0.06
										Total of Receptor Risks Across All Media	1.7E-04				Total of Receptor Hazards Across All Media	0.06

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	9.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	7.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	6.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.4E-08	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.8E-07	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	8.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.7E-06					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	6.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.4E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-08	9.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	9.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-07	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.6E-06					--
		Exposure Point Total									1.3E-05					--
	Exposure Medium Total										1.3E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	2.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-13	5.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	2.1E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.3E-12	4.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	1.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-13	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	3.6E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.3E-13	7.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	9.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-12					--
		Exposure Point Total									3.3E-12					--
	Exposure Medium Total										3.3E-12					--
Medium Total											1.3E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.005
				2-Methylnaphthalene	32.0	mg/kg	5.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	17	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0005
				Benzo(a)anthracene	23	mg/kg	1.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-05	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.1E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-04	4.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-05	3.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Benzo(k)fluoranthene	8.2	mg/kg	6.8E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.0E-07	1.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.9E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.4E-07	4.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	3.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-05	7.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	4.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Fluorene	15.0	mg/kg	2.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	8.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.9E-06	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	4.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.002
				Phenanthrene	64	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
				Pyrene	51	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
			Exp. Route Total								2.1E-04					0.03

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32.0	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.008
				Acenaphthylene	17	mg/kg	1.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0004
				Benzo(a)anthracene	23	mg/kg	1.4E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-05	3.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.5E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-04	3.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-06	2.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	1.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0006
				Benzo(k)fluoranthene	8.2	mg/kg	5.0E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.6E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.4E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-07	3.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-05	5.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Fluorene	15.0	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	5.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-06	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.002
				Phenanthrene	64	mg/kg	7.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
				Pyrene	51	mg/kg	5.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
			Exp. Route Total								1.5E-04					0.02
		Exposure Point Total									3.7E-04					0.05
	Exposure Medium Total										3.7E-04					0.05
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	3.4E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	1.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	4.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	5.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.6E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	5.6E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	6.1E-11	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	4.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.9E-12	9.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	5.8E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	1.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.0E-12	4.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	5.1E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	5.6E-13	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	9.6E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-11	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	1.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	1.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	2.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	4.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	1.9E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	6.4E-08	2.2E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.007
				Phenanthrene	3.5E-4	mg/m^3	1.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	2.1E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.5E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.4E-08					0.007
		Exposure Point Total									6.4E-08					0.007
	Exposure Medium Total										6.4E-08					0.007
Medium Total											3.7E-04					0.06
										Total of Receptor Risks Across All Media	3.8E-04				Total of Receptor Hazards Across All Media	0.06

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	7.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.4E-07	9.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.6E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.4E-09	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-08	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	4.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.9E-07					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	7.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.3E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-07	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-09	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.8E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	4.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.2E-07					--
		Exposure Point Total									1.2E-06					--
	Exposure Medium Total										1.2E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-13	2.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	1.5E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.7E-12	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	1.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-13	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	2.5E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.1E-13	4.1E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	7.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.7E-14	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.4E-12					--
		Exposure Point Total									2.4E-12					--
	Exposure Medium Total										2.4E-12					--
Medium Total											1.2E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	2.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0003
				2-Methylnaphthalene	32	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0008
				Acenaphthylene	17	mg/kg	5.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-06	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	2.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	4.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Benzo(k)fluoranthene	8.2	mg/kg	5.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-08	8.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.1E-08	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00008
				Fluorene	15	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00004
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	6.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-07	9.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	9.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	64	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	51	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								1.6E-05					0.002

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	8.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.6E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0006
				Acenaphthylene	17	mg/kg	6.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-06	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	2.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	5.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Benzo(k)fluoranthene	8.2	mg/kg	5.4E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.0E-08	8.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.5E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.1E-08	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-06	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00008
				Fluorene	15	mg/kg	5.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00004
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	6.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-07	1.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	64	mg/kg	2.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	51	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								1.7E-05					0.001
		Exposure Point Total									3.3E-05					0.003
	Exposure Medium Total										3.3E-05					0.003
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	7.1E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	3.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	9.8E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	3.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.0E-12	5.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	4.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.4E-11	6.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	3.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-12	5.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	1.2E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	1.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	3.7E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	4.0E-13	5.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	6.8E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.2E-12	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	2.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	3.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	1.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-12	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	3.9E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.3E-07	1.1E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.004
				Phenanthrene	3.5E-4	mg/m^3	2.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	4.4E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-07					0.004
		Exposure Point Total									1.3E-07					0.004
	Exposure Medium Total										1.3E-07					0.004
Medium Total											- -					--
										Total of Receptor Risks Across All Media	3.4E-05			Total of Receptor Hazards Across All Media		--

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	6.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-06	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-05	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.2E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.1E-07	9.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	9.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-06	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-06	5.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.4E-05					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	2.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-06	5.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-05	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	3.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-06	7.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	9.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.8E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.0E-05					--
		Exposure Point Total									7.4E-05					--
	Exposure Medium Total										7.4E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	5.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	4.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.9E-11	9.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	3.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-12	7.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	7.5E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	9.0E-12	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	2.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-12	4.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.0E-11					--
		Exposure Point Total									7.0E-11					--
	Exposure Medium Total										7.0E-11					--
Medium Total											7.4E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	9.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.03
				2-Methylnaphthalene	32	mg/kg	3.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.1
				Acenaphthylene	17	mg/kg	1.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.004
				Benzo(a)anthracene	23	mg/kg	1.3E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.8E-05	2.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.5E-04	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-03	3.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.2E-04	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-05	2.6E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.006
				Benzo(k)fluoranthene	8.2	mg/kg	4.8E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-06	1.0E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.3E-04	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	9.8E-07	2.9E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.5E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-04	5.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	3.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.010
				Fluorene	15	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.005
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	5.6E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.1E-05	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	2.8E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.02
				Phenanthrene	64	mg/kg	7.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.03
				Pyrene	51	mg/kg	5.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.02
			Exp. Route Total								1.5E-03					0.2

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	9.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.03
				Acenaphthylene	17	mg/kg	6.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.9E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	23	mg/kg	4.9E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-05	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	5.3E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-04	1.2E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	4.3E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-05	9.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	5.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	8.2	mg/kg	1.7E-05	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-06	3.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	4.9E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.6E-07	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	9.1E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-05	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.004
				Fluorene	15	mg/kg	6.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	2.0E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-05	4.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.006
				Phenanthrene	64	mg/kg	2.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.010
				Pyrene	51	mg/kg	2.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.008
			Exp. Route Total								5.4E-04					0.06
		Exposure Point Total									2.0E-03					0.3
	Exposure Medium Total										2.0E-03					0.3
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	7.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	3.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.5E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	9.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	1.1E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-10	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	1.2E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-09	2.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	9.4E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-10	2.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	1.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	3.8E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-11	8.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	1.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.2E-11	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	2.0E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.4E-10	4.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	2.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	3.7E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	4.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.9E-11	9.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	3.9E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.3E-06	4.6E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.2
				Phenanthrene	3.5E-4	mg/m^3	2.8E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	4.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-06					0.2
		Exposure Point Total									1.3E-06					0.2
	Exposure Medium Total										1.3E-06					0.2
Medium Total											2.0E-03					0.4
										Total of Receptor Risks Across All Media	2.1E-03				Total of Receptor Hazards Across All Media	0.4

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	9.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	8.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.0E-06	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	6.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.5E-08	9.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-06	2.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-07	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.0E-06					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	4.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-07	7.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	4.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.1E-06	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	3.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.3E-08	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	7.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.1E-06					--
		Exposure Point Total									1.2E-05					--
	Exposure Medium Total										1.2E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	7.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.8E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	6.1E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	6.7E-11	9.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	4.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.1E-12	7.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	1.0E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.2E-11	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	2.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-12	4.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								9.6E-11					--
		Exposure Point Total									9.6E-11					--
	Exposure Medium Total										9.6E-11					--
Medium Total											1.2E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	3.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				2-Methylnaphthalene	32	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.01
				Acenaphthylene	17	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0004
				Benzo(a)anthracene	23	mg/kg	2.0E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-05	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.2E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-04	3.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-05	2.7E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	6.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0006
				Benzo(k)fluoranthene	8.2	mg/kg	7.1E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.2E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	2.0E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.4E-07	3.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	3.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-05	5.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.5E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.001
				Fluorene	15	mg/kg	7.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	8.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.0E-06	1.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.002
				Phenanthrene	64	mg/kg	3.0E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.003
				Pyrene	51	mg/kg	2.4E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
			Exp. Route Total								2.2E-04					0.02

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	6.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	17	mg/kg	4.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	23	mg/kg	1.0E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-06	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.1E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-05	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	8.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.5E-06	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	3.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	8.2	mg/kg	3.7E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-07	5.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.0E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.5E-08	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	1.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-05	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	7.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0006
				Fluorene	15	mg/kg	3.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	4.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-06	6.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	6.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0009
				Phenanthrene	64	mg/kg	1.6E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	51	mg/kg	1.2E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								1.1E-04					0.009
		Exposure Point Total									3.3E-04					0.03
	Exposure Medium Total										3.3E-04					0.03
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	2.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	1.5E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.5E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	3.9E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-04	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	1.5E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-10	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	1.6E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.8E-09	2.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	1.3E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-10	2.0E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	4.9E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	5.3E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.8E-11	8.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	1.5E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.6E-11	2.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	2.8E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.3E-10	4.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	1.1E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	1.5E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	6.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.8E-11	9.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	1.6E-04	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	5.3E-06	4.6E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.2
				Phenanthrene	3.5E-4	mg/m^3	1.1E-04	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	1.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.3E-06					0.2
		Exposure Point Total									5.3E-06					0.2
	Exposure Medium Total										5.3E-06					0.2
Medium Total											3.4E-04					0.2
										Total of Receptor Risks Across All Media	3.5E-04				Total of Receptor Hazards Across All Media	0.2

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	7.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-09	5.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-08	4.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	5.0E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.6E-10	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	1.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.1E-09	7.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-09	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.4E-08					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	2.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-09	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.3E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.5E-11	9.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	2.9E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-09	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	7.9E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-10	5.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.7E-08					--
		Exposure Point Total									8.1E-08					--
	Exposure Medium Total										8.1E-08					--
	Air	OU9	Inhalation	Benzo(a)anthracene	7.7E-7	mg/m^3	7.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.3E-11	5.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	6.6E-7	mg/m^3	6.5E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.2E-10	4.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.0E-7	mg/m^3	4.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.4E-11	3.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.1E-7	mg/m^3	1.1E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.3E-10	7.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.1E-7	mg/m^3	3.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-11	2.1E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-09					--
		Exposure Point Total									1.0E-09					--
	Exposure Medium Total										1.0E-09					--
Medium Total											8.2E-08					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	5.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				2-Methylnaphthalene	32.0	mg/kg	2.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	17	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	23	mg/kg	1.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-07	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.7E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-07	9.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	9.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	8.2	mg/kg	5.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.1E-09	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.6E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.2E-09	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	3.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	2.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0004
				Fluorene	15.0	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	6.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-08	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	64	mg/kg	4.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	51	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0008
			Exp. Route Total								1.8E-06					0.009

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32.0	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0008
				Acenaphthylene	17	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00004
				Benzo(a)anthracene	23	mg/kg	4.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-08	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	4.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	3.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00006
				Benzo(k)fluoranthene	8.2	mg/kg	1.5E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-09	1.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	4.1E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.0E-10	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	7.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.6E-08	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	5.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00010
				Fluorene	15.0	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	4.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	64	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	51	mg/kg	9.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								4.6E-07					0.002
		Exposure Point Total									2.2E-06					0.01
	Exposure Medium Total										2.2E-06					0.01
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	5.7E-7	mg/m^3	5.6E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-03	mg/m^3	2.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	6.4E-4	mg/m^3	6.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.7E-09	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.7E-5	mg/m^3	1.7E-08	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.9E-08	1.2E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	1.4E-5	mg/m^3	1.4E-08	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-09	9.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	9.8E-6	mg/m^3	9.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.7E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	5.7E-6	mg/m^3	5.6E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.2E-10	3.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	1.6E-5	mg/m^3	1.6E-08	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.7E-10	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	3.0E-6	mg/m^3	2.9E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-09	2.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	2.2E-5	mg/m^3	2.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	2.5E-4	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	6.7E-6	mg/m^3	6.6E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.2E-10	4.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	2.5E-03	mg/m^3	2.5E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	8.4E-08	1.7E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.1
				Phenanthrene	1.9E-3	mg/m^3	1.8E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.3E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	3.6E-5	mg/m^3	3.5E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-06	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-07					0.1
		Exposure Point Total									1.1E-07					0.1
	Exposure Medium Total										1.1E-07					0.1
Medium Total											2.3E-06					0.1
										Total of Receptor Risks Across All Media	2.4E-06				Total of Receptor Hazards Across All Media	0.1

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	6.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-08	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.8E-07	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	8.8E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.4E-08	6.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.1E-07					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-09	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	9.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-08	7.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	6.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.0E-10	5.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-09	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.8E-08					--
		Exposure Point Total									6.0E-07					--
	Exposure Medium Total										6.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	3.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-13	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	2.6E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.9E-12	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	2.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-13	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	4.4E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.3E-13	3.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	1.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-13	9.4E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.1E-12					--
		Exposure Point Total									4.1E-12					--
	Exposure Medium Total										4.1E-12					--
Medium Total											6.0E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	4.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				2-Methylnaphthalene	32	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.003
				Acenaphthylene	17	mg/kg	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	23	mg/kg	1.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-07	9.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.4E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.0E-07	8.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	7.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	8.2	mg/kg	4.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.3E-08	3.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.3E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	9.3E-09	9.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	15	mg/kg	8.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	5.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.9E-07	4.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	64	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0009
				Pyrene	51	mg/kg	2.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0007
			Exp. Route Total								1.4E-05					0.008

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0005
				Acenaphthylene	17	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00002
				Benzo(a)anthracene	23	mg/kg	2.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00003
				Benzo(k)fluoranthene	8.2	mg/kg	7.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.7E-09	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	2.2E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.6E-09	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	4.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-07	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	2.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00006
				Fluorene	15	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	9.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.6E-08	7.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	2.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00010
				Phenanthrene	64	mg/kg	6.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	51	mg/kg	4.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
			Exp. Route Total								2.4E-06					0.0010
		Exposure Point Total									1.6E-05					0.009
	Exposure Medium Total										1.6E-05					0.009
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	2.3E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	1.2E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.3E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	3.1E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	6.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.9E-12	4.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	6.9E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.5E-11	5.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	5.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.0E-12	4.3E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	3.8E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	2.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.5E-12	1.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	6.3E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	6.9E-13	4.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	1.2E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-11	9.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	8.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	1.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	2.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.9E-12	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	1.2E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	4.2E-07	9.5E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.03
				Phenanthrene	3.5E-4	mg/m^3	8.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	1.4E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.2E-07					0.03
		Exposure Point Total									4.2E-07					0.03
	Exposure Medium Total										4.2E-07					0.03
Medium Total											1.7E-05					0.04
										Total of Receptor Risks Across All Media	1.7E-05				Total of Receptor Hazards Across All Media	0.04

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	2.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-06	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	1.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-08	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	3.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-07	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	9.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.7E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.9E-06					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	6.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	5.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	4.4E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-09	9.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	9.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.1E-08	2.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	2.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-08	5.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.6E-07					--
		Exposure Point Total									2.5E-06					--
	Exposure Medium Total										2.5E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	6.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-14	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	5.3E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.8E-13	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	4.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-14	8.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	8.9E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-13	1.9E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	2.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-14	5.4E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.3E-13					--
		Exposure Point Total									8.3E-13					--
	Exposure Medium Total										8.3E-13					--
Medium Total											2.5E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	3.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				2-Methylnaphthalene	32	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	17	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	23	mg/kg	4.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	5.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.8E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	4.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-06	9.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	5.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	8.2	mg/kg	1.7E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-07	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	4.8E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.5E-08	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	9.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-06	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0004
				Fluorene	15	mg/kg	5.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	2.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-06	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	64	mg/kg	2.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0010
				Pyrene	51	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0008
			Exp. Route Total								5.3E-05					0.008

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0008
				Acenaphthylene	17	mg/kg	1.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00004
				Benzo(a)anthracene	23	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00006
				Benzo(k)fluoranthene	8.2	mg/kg	5.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.6E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-06	5.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	15	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	5.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-07	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	3.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	64	mg/kg	7.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	51	mg/kg	5.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								1.5E-05					0.002
		Exposure Point Total									6.8E-05					0.010
	Exposure Medium Total										6.8E-05					0.010
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	8.6E-14	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	4.6E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	1.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.5E-11	3.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	1.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-12	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	1.5E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	4.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.0E-13	1.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	1.3E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.4E-13	2.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	2.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.9E-12	5.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	3.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	4.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	5.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.9E-13	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	4.7E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.6E-08	5.5E-06	(mg/m^3)	3.0E-03	(mg/m^3)	0.002
				Phenanthrene	3.5E-4	mg/m^3	3.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	5.3E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-08					0.002
		Exposure Point Total									1.6E-08					0.002
	Exposure Medium Total										1.6E-08					0.002
Medium Total											6.8E-05					0.01
										Total of Receptor Risks Across All Media	7.1E-05				Total of Receptor Hazards Across All Media	0.01

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	1.10	mg/kg	1.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	2.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	9.5E-1	mg/kg	1.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	2.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	7.2E-1	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.4E-10	1.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	2.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-08	4.1E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	4.4E-1	mg/kg	7.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-09	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.5E-07					--
			Dermal	Benzo(a)anthracene	1.10	mg/kg	5.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-09	8.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	9.5E-1	mg/kg	4.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-08	7.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	7.2E-1	mg/kg	3.4E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.5E-10	5.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.160	mg/kg	7.6E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-09	1.2E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	4.4E-1	mg/kg	2.1E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-09	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.4E-08					--
		Exposure Point Total									1.9E-07					--
	Exposure Medium Total										1.9E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	4.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.8E-14	7.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	3.8E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.2E-13	6.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	2.9E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-14	4.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	6.4E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.6E-14	1.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	1.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-14	2.8E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.9E-13					--
		Exposure Point Total									5.9E-13					--
	Exposure Medium Total										5.9E-13					--
Medium Total											1.9E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	8.2E-1	mg/kg	7.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00007
				2-Methylnaphthalene	32.0	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0002
				Acenaphthylene	17	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000007
				Benzo(a)anthracene	23	mg/kg	3.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	4.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.9E-06	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	3.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
				Benzo(k)fluoranthene	8.2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.6E-09	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	3.7E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.7E-09	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	6.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.9E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Fluorene	15.0	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000010
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Phenanthrene	64	mg/kg	5.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Pyrene	51	mg/kg	4.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
			Exp. Route Total								4.0E-06					0.0005

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	8.2E-1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32.0	mg/kg	6.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00005
				Acenaphthylene	17	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000002
				Benzo(a)anthracene	23	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.0E-08	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.7E-07	1.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	9.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14.0	mg/kg	3.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000004
				Benzo(k)fluoranthene	8.2	mg/kg	3.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.8E-09	6.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.1E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	8.0E-10	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	2.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	3.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	8.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000006
				Fluorene	15.0	mg/kg	3.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	4.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-08	7.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	6.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.0E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.000010
				Phenanthrene	64	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00002
				Pyrene	51	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
			Exp. Route Total								1.2E-06					0.00010
		Exposure Point Total									5.2E-06					0.0006
	Exposure Medium Total										5.2E-06					0.0006
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	1.8E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-13	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	9.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	9.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-12	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	1.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	8.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.8E-13	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	3.0E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	3.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.6E-13	5.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	9.2E-12	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.0E-13	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	1.7E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.1E-12	2.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	6.7E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	9.2E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-07	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	3.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-13	6.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	9.7E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.3E-08	2.8E-06	(mg/m^3)	3.0E-03	(mg/m^3)	0.0009
				Phenanthrene	3.5E-4	mg/m^3	7.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	1.1E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.3E-08					0.0009
		Exposure Point Total									3.3E-08					0.0009
	Exposure Medium Total										3.3E-08					0.0009
Medium Total											5.3E-06					0.001
										Total of Receptor Risks Across All Media	5.5E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	8.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-07	4.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	7.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-06	4.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	5.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.2E-08	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.5E-07	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.4E-06					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-08	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.0E-07	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	8.3E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.1E-09	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	5.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-08	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.1E-06					--
		Exposure Point Total									8.4E-06					--
	Exposure Medium Total										8.4E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	1.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-12	7.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.3E-11	6.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	9.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-12	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	2.0E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.4E-12	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	5.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.1E-13	3.0E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.9E-11					--
		Exposure Point Total									1.9E-11					--
	Exposure Medium Total										1.9E-11					--
Medium Total											8.4E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	32	mg/kg	3.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.03
				Acenaphthylene	17	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.001
				Benzo(a)anthracene	23	mg/kg	1.8E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-05	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.0E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-04	1.1E-04	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.6E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-05	8.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Benzo(k)fluoranthene	8.2	mg/kg	6.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.8E-07	3.5E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.8E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.3E-07	9.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	3.4E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-05	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	3.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.003
				Fluorene	15	mg/kg	1.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	7.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-06	4.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-04	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.006
				Phenanthrene	64	mg/kg	7.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.009
				Pyrene	51	mg/kg	6.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.007
			Exp. Route Total								2.0E-04					0.08

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	4.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	17	mg/kg	3.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	23	mg/kg	2.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-06	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-05	1.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	2.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-06	1.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	2.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.7E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Benzo(k)fluoranthene	8.2	mg/kg	9.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.9E-08	5.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	2.7E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.9E-08	1.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	5.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	5.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0005
				Fluorene	15	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.1E-07	6.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	4.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0008
				Phenanthrene	64	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Pyrene	51	mg/kg	9.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								2.9E-05					0.008
		Exposure Point Total									2.3E-04					0.08
	Exposure Medium Total										2.3E-04					0.08
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	1.6E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	8.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	2.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	2.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.2E-11	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	3.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.5E-10	1.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	2.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-11	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	2.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	1.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	5.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	2.9E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.2E-12	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	5.5E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.6E-11	2.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	6.1E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	8.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	1.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-11	6.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	8.7E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.0E-07	3.1E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.1
				Phenanthrene	3.5E-4	mg/m^3	6.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	1.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.0E-07					0.1
		Exposure Point Total									3.0E-07					0.1
	Exposure Medium Total										3.0E-07					0.1
Medium Total											2.3E-04					0.2
										Total of Receptor Risks Across All Media	2.4E-04				Total of Receptor Hazards Across All Media	0.2

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	1.1	mg/kg	7.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.8E-08	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	6.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-07	4.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	5.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-09	3.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.4E-08	7.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	3.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.7E-07					--
			Dermal	Benzo(a)anthracene	1.1	mg/kg	1.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.6E-09	7.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.95	mg/kg	1.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.4E-08	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.72	mg/kg	7.7E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.6E-10	4.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.16	mg/kg	1.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.44	mg/kg	4.7E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-09	3.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								9.9E-08					--
		Exposure Point Total									7.7E-07					--
	Exposure Medium Total										7.7E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	1.2E-10	mg/m^3	1.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-12	7.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	1.0E-10	mg/m^3	1.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	6.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	7.7E-11	mg/m^3	7.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.5E-13	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.7E-11	mg/m^3	1.7E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.1E-12	1.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	4.7E-11	mg/m^3	4.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.2E-13	3.0E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-11					--
		Exposure Point Total									1.6E-11					--
	Exposure Medium Total										1.6E-11					--
Medium Total											7.7E-07					--

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.82	mg/kg	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				2-Methylnaphthalene	32	mg/kg	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	17	mg/kg	7.8E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.8E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	23	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.2E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	1.8E-06	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.3E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.1E-06	9.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	6.4E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	8.2	mg/kg	5.9E-07	(mg/kg/day)	7.3E-02	(mg/kg/day)$^{-1}$	4.3E-08	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	1.7E-06	(mg/kg/day)	7.3E-03	(mg/kg/day)$^{-1}$	1.2E-08	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	3.1E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-06	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.4E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0004
				Fluorene	15	mg/kg	6.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	6.9E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	5.0E-07	4.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0006
				Phenanthrene	64	mg/kg	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0010
				Pyrene	51	mg/kg	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0008
			Exp. Route Total								1.8E-05					0.008
			Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.82	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	32	mg/kg	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.7E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0004
				Acenaphthylene	17	mg/kg	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.2E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00002
				Benzo(a)anthracene	23	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.8E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	25	mg/kg	2.7E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	1.9E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	20	mg/kg	2.1E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.6E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	14	mg/kg	9.5E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	9.5E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00003
				Benzo(k)fluoranthene	8.2	mg/kg	8.7E-08	(mg/kg/day)	7.3E-02	(mg/kg/day)$^{-1}$	6.4E-09	5.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	23	mg/kg	2.5E-07	(mg/kg/day)	7.3E-03	(mg/kg/day)$^{-1}$	1.8E-09	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	4.3	mg/kg	4.6E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.3E-07	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	31	mg/kg	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Fluorene	15	mg/kg	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.0E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Indeno(1,2,3-cd)pyrene	9.6	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	7.5E-08	6.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	26	mg/kg	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.8E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00009
				Phenanthrene	64	mg/kg	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
				Pyrene	51	mg/kg	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
			Exp. Route Total								2.7E-06					0.0009
		Exposure Point Total									2.1E-05					0.009
Exposure Medium Total											2.1E-05					0.009

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	8.8E-11	mg/m^3	5.6E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	4.7E-04	mg/m^3	3.0E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.0E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	7.7E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	7.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	2.5E-9	mg/m^3	2.5E-10	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	2.7E-11	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	2.7E-9	mg/m^3	2.7E-10	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	3.0E-10	1.7E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.1E-9	mg/m^3	2.2E-10	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	2.4E-11	1.4E-09	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	1.5E-9	mg/m^3	9.6E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	9.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	8.8E-10	mg/m^3	8.8E-11	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	9.7E-12	5.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	2.5E-9	mg/m^3	2.5E-10	(mg/m^3)	1.1E-05	(ug/m^3)$^{-1}$	2.7E-12	1.6E-09	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	4.6E-10	mg/m^3	4.6E-11	(mg/m^3)	1.2E-03	(ug/m^3)$^{-1}$	5.5E-11	2.9E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	3.3E-9	mg/m^3	2.1E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.1E-09	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.5E-5	mg/m^3	2.9E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.9E-05	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.0E-9	mg/m^3	1.0E-10	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	1.1E-11	6.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.8E-04	mg/m^3	3.1E-05	(mg/m^3)	3.4E-05	(ug/m^3)$^{-1}$	1.0E-06	3.1E-04	(mg/m^3)	3.0E-03	(mg/m^3)	0.1
				Phenanthrene	3.5E-4	mg/m^3	2.2E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	5.4E-9	mg/m^3	3.5E-10	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	3.5E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-06					0.1
		Exposure Point Total									1.0E-06					0.1
	Exposure Medium Total										1.0E-06					0.1
Medium Total											2.2E-05					0.1
							Total of Receptor Risks Across All Media				2.3E-05	Total of Receptor Hazards Across All Media				0.1

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface/Subsurface Soil
9.6.RME	Child Residents - Entire Site Surface/Subsurface Soil
9.7.RME	Adult Residents - Entire Site Surface/Subsurface Soil
9.8.RME	Lifetime Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
9.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	2E-08	--	9E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	6E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	3E-07	--	1E-07	--	4E-07		--	--	--	--
		Exposure Point Total						4E-07					--
	Exposure Medium Total							4E-07					--
	Air	OU9	Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	--	- -	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Medium Total								4E-07					--

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.005	- -	--	0.005
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.02	- -	0.005	0.02
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0005	- -	0.0002	0.0008
			Benzo(a)anthracene	5E-07	--	2E-07	--	6E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	2E-06	--	7E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	4E-07	--	2E-07	--	6E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0009	- -	0.0004	0.001
			Benzo(k)fluoranthene	2E-08	--	6E-09	--	2E-08	NA	--	- -	--	--
			Chrysene	5E-09	--	2E-09	--	6E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	9E-07	--	3E-07	--	1E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0006	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.0007	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	2E-07	--	8E-08	--	3E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.003	- -	0.0010	0.004
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.002	0.006
			Pyrene	- -	--	- -	--	- -	Kidney	0.003	- -	0.001	0.005
			Chemical Total	7E-06	--	3E-06	--	1E-05		0.03	--	0.010	0.04
		Exposure Point Total						1E-05					0.04
Exposure Medium Total								1E-05					0.04

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-08	--	--	4E-08	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-09	--	--	3E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Chrysene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-09	--	--	7E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Naphthalene	--	2E-07	--	--	2E-07	Nasal	- -	0.1	- -	0.1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.1	- -	0.1
		Exposure Point Total						2E-07					0.1
	Exposure Medium Total							2E-07					0.1
Medium Total								1E-05					0.2
Receptor Total							Receptor Risk Total	1E-05				Receptor HI Total	0.2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.005
Total Blood HI	0.002
Total Body Weight HI	0.004
Total Kidney HI	0.01
Total Liver HI	0.003
Total Lungs HI	0.02
Total Nasal HI	0.1

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	3E-07	--	2E-07	--	5E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-08	--	2E-08	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	1E-07	--	1E-07	--	2E-07	NA	--	- -	--	--
			Chemical Total	3E-06	--	3E-06	--	6E-06		--	--	--	--
		Exposure Point Total						6E-06					--
	Exposure Medium Total							6E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								6E-06					--

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.003	- -	--	0.003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.005	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0003	- -	0.0002	0.0005
			Benzo(a)anthracene	6E-06	--	5E-06	--	1E-05	NA	--	- -	--	--
			Benzo(a)pyrene	6E-05	--	5E-05	--	1E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	5E-06	--	4E-06	--	9E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0005	- -	0.0004	0.0008
			Benzo(k)fluoranthene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chrysene	6E-08	--	5E-08	--	1E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-05	--	9E-06	--	2E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0008	- -	0.0007	0.001
			Fluorene	- -	--	- -	--	- -	Blood	0.0004	- -	0.0003	0.0007
			Indeno(1,2,3-cd)pyrene	2E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.001	- -	0.001	0.002
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.002	- -	0.002	0.004
			Pyrene	- -	--	- -	--	- -	Kidney	0.002	- -	0.001	0.003
			Chemical Total	9E-05	--	8E-05	--	2E-04		0.02	--	0.01	0.03
		Exposure Point Total						2E-04					0.03
Exposure Medium Total								2E-04					0.03

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Chrysene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.04	- -	0.04
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.04	- -	0.04
		Exposure Point Total						1E-06					0.04
	Exposure Medium Total							1E-06					0.04
Medium Total								2E-04					0.06
Receptor Total							Receptor Risk Total	2E-04				Receptor HI Total	0.06

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.003
Total Blood HI	0.001
Total Body Weight HI	0.002
Total Kidney HI	0.007
Total Liver HI	0.002
Total Lungs HI	0.01
Total Nasal HI	0.04

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	7E-07	--	5E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	6E-06	--	4E-06	--	1E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	8E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-07	--	2E-07	--	5E-07	NA	--	- -	--	--
			Chemical Total	8E-06	--	6E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								1E-05					--

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.005	- -	--	0.005
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.008	0.02
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0005	- -	0.0004	0.0009
			Benzo(a)anthracene	1E-05	--	1E-05	--	2E-05	NA	--	- -	--	--
			Benzo(a)pyrene	2E-04	--	1E-04	--	3E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-05	--	9E-06	--	2E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0009	- -	0.0006	0.001
			Benzo(k)fluoranthene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Chrysene	1E-07	--	1E-07	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.001	- -	0.001	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.0007	- -	0.0005	0.001
			Indeno(1,2,3-cd)pyrene	6E-06	--	4E-06	--	1E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.002	- -	0.002	0.004
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.003	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.003	- -	0.002	0.005
			Chemical Total	2E-04	--	2E-04	--	4E-04		0.03	--	0.02	0.05
		Exposure Point Total						4E-04					0.05
Exposure Medium Total								4E-04					0.05

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	6E-08	--	--	6E-08	Nasal	- -	0.007	- -	0.007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	6E-08	--	--	6E-08		- -	0.007	- -	0.007
		Exposure Point Total						6E-08					0.007
	Exposure Medium Total							6E-08					0.007
Medium Total								4E-04					0.06
Receptor Total							Receptor Risk Total	4E-04				Receptor HI Total	0.06

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.005
Total Blood HI	0.002
Total Body Weight HI	0.004
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.02
Total Nasal HI	0.007

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	5E-08	--	5E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	5E-07	--	9E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	3E-09	--	7E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-08	--	8E-08	--	2E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	2E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	6E-07	--	6E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	8E-14	--	--	8E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0003	- -	--	0.0003
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0008	- -	0.0006	0.001
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00003	- -	0.00003	0.00006
			Benzo(a)anthracene	1E-06	--	1E-06	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	1E-05	--	1E-05	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	9E-07	--	1E-06	--	2E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00005	- -	0.00005	0.00010
			Benzo(k)fluoranthene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Chrysene	1E-08	--	1E-08	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00008	- -	0.00008	0.0002
			Fluorene	- -	--	- -	--	- -	Blood	0.00004	- -	0.00004	0.00008
			Indeno(1,2,3-cd)pyrene	4E-07	--	5E-07	--	9E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0001	- -	0.0001	0.0003
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.0002	0.0004
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.0002	0.0004
			Chemical Total	2E-05	--	2E-05	--	3E-05		0.002	--	0.001	0.003
		Exposure Point Total						3E-05					0.003
Exposure Medium Total								3E-05					0.003

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Chrysene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	1E-07	--	--	1E-07	Nasal	- -	0.004	- -	0.004
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.004	- -	0.004
		Exposure Point Total						1E-07					0.004
	Exposure Medium Total							1E-07					0.004
Medium Total								3E-05					0.007
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	--

Total Blood HI	0.0001
Total Body Weight HI	0.0003
Total Kidney HI	0.0008
Total Liver HI	0.0003
Total Lungs HI	0.001
Total Nasal HI	0.004

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	7E-07	--	5E-07	--	1E-06
			Benzo(a)pyrene	6E-06	--	5E-06	--	1E-05
			Benzo(b)fluoranthene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	5E-08	--	4E-08	--	8E-08
			Dibenzo(a,h)anthracene	1E-06	--	8E-07	--	2E-06
			Indeno(1,2,3-cd)pyrene	3E-07	--	2E-07	--	5E-07
			Chemical Total	8E-06	--	6E-06	--	1E-05
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
	Air	OU9	Benzo(a)anthracene	--	5E-13	--	--	5E-13
			Benzo(a)pyrene	--	4E-12	--	--	4E-12
			Benzo(b)fluoranthene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13
			Dibenzo(a,h)anthracene	--	7E-13	--	--	7E-13
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13
			Chemical Total	--	6E-12	--	--	6E-12
		Exposure Point Total						6E-12
	Exposure Medium Total							6E-12
Medium Total								1E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	2E-05	--	1E-05	--	3E-05
			Benzo(a)pyrene	2E-04	--	1E-04	--	3E-04
			Benzo(b)fluoranthene	1E-05	--	1E-05	--	2E-05
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	5E-07	--	4E-07	--	9E-07
			Chrysene	2E-07	--	1E-07	--	3E-07
			Dibenzo(a,h)anthracene	3E-05	--	2E-05	--	5E-05
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	6E-06	--	5E-06	--	1E-05
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	2E-04	--	2E-04	--	4E-04
		Exposure Point Total						4E-04
	Exposure Medium Total							4E-04

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(b)fluoranthene	--	8E-12	--	--	8E-12
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12
			Chrysene	--	1E-12	--	--	1E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	4E-12	--	--	4E-12
			Naphthalene	--	2E-07	--	--	2E-07
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	2E-07	--	--	2E-07
		Exposure Point Total						2E-07
	Exposure Medium Total							2E-07
Medium Total								4E-04

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Receptor Total							Receptor Risk Total	4E-04

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	5E-06	--	2E-06	--	6E-06	NA	--	- -	--	--
			Benzo(a)pyrene	4E-05	--	1E-05	--	6E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-06	--	2E-06	--	9E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	--	3E-06	NA	--	- -	--	--
			Chemical Total	5E-05	--	2E-05	--	7E-05		--	--	--	--
		Exposure Point Total						7E-05					--
	Exposure Medium Total							7E-05					--
	Air	OU9	Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	7E-11	--	--	7E-11		- -	--	- -	--
		Exposure Point Total						7E-11					--
	Exposure Medium Total							7E-11					--
Medium Total								7E-05					--

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.03	- -	--	0.03
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.1	- -	0.03	0.1
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.004	- -	0.001	0.005
			Benzo(a)anthracene	1E-04	--	4E-05	--	1E-04	NA	--	- -	--	--
			Benzo(a)pyrene	1E-03	--	4E-04	--	1E-03	NA	--	- -	--	--
			Benzo(b)fluoranthene	9E-05	--	3E-05	--	1E-04	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.006	- -	0.002	0.008
			Benzo(k)fluoranthene	3E-06	--	1E-06	--	5E-06	NA	--	- -	--	--
			Chrysene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-04	--	7E-05	--	3E-04	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.010	- -	0.004	0.01
			Fluorene	- -	--	- -	--	- -	Blood	0.005	- -	0.002	0.007
			Indeno(1,2,3-cd)pyrene	4E-05	--	1E-05	--	6E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.02	- -	0.006	0.02
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.03	- -	0.010	0.04
			Pyrene	- -	--	- -	--	- -	Kidney	0.02	- -	0.008	0.03
			Chemical Total	1E-03	--	5E-04	--	2E-03		0.2	--	0.06	0.3
		Exposure Point Total						2E-03					0.3
Exposure Medium Total								2E-03					0.3

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Chrysene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.2	- -	0.2
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.2	- -	0.2
		Exposure Point Total						1E-06					0.2
	Exposure Medium Total							1E-06					0.2
Medium Total								2E-03					0.4
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	0.4

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	0.01
Total Body Weight HI	0.02
Total Kidney HI	0.07
Total Liver HI	0.02
Total Lungs HI	0.1
Total Nasal HI	0.2

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	7E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	6E-06	--	3E-06	--	9E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	5E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	5E-07	--	2E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	8E-06	--	4E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chemical Total	--	1E-10	--	--	1E-10		- -	--	- -	--
		Exposure Point Total						1E-10					--
	Exposure Medium Total							1E-10					--
Medium Total								1E-05					--

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.004	- -	--	0.004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.01	- -	0.004	0.02
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0004	- -	0.0002	0.0006
			Benzo(a)anthracene	1E-05	--	7E-06	--	2E-05	NA	--	- -	--	--
			Benzo(a)pyrene	2E-04	--	8E-05	--	2E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-05	--	7E-06	--	2E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0006	- -	0.0003	0.0010
			Benzo(k)fluoranthene	5E-07	--	3E-07	--	8E-07	NA	--	- -	--	--
			Chrysene	1E-07	--	7E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-05	--	1E-05	--	4E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.001	- -	0.0006	0.002
			Fluorene	- -	--	- -	--	- -	Blood	0.0005	- -	0.0003	0.0008
			Indeno(1,2,3-cd)pyrene	6E-06	--	3E-06	--	9E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.002	- -	0.0009	0.003
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.003	- -	0.002	0.004
			Pyrene	- -	--	- -	--	- -	Kidney	0.002	- -	0.001	0.004
			Chemical Total	2E-04	--	1E-04	--	3E-04		0.02	--	0.009	0.03
		Exposure Point Total						3E-04					0.03
Exposure Medium Total								3E-04					0.03

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chrysene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Naphthalene	--	5E-06	--	--	5E-06	Nasal	- -	0.2	- -	0.2
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	5E-06	--	--	5E-06		- -	0.2	- -	0.2
		Exposure Point Total						5E-06					0.2
	Exposure Medium Total							5E-06					0.2
Medium Total								3E-04					0.2
Receptor Total							Receptor Risk Total	3E-04				Receptor HI Total	0.2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.004
Total Blood HI	0.001
Total Body Weight HI	0.003
Total Kidney HI	0.008
Total Liver HI	0.003
Total Lungs HI	0.02
Total Nasal HI	0.2

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	5E-06	--	2E-06	--	7E-06
			Benzo(a)pyrene	5E-05	--	2E-05	--	6E-05
			Benzo(b)fluoranthene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	4E-07	--	1E-07	--	5E-07
			Dibenzo(a,h)anthracene	8E-06	--	3E-06	--	1E-05
			Indeno(1,2,3-cd)pyrene	2E-06	--	8E-07	--	3E-06
			Chemical Total	6E-05	--	2E-05	--	9E-05
		Exposure Point Total						9E-05
	Exposure Medium Total							9E-05
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(b)fluoranthene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	9E-12	--	--	9E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Indeno(1,2,3-cd)pyrene	--	5E-12	--	--	5E-12
			Chemical Total	--	2E-10	--	--	2E-10
		Exposure Point Total						2E-10
	Exposure Medium Total							2E-10
Medium Total								9E-05

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	1E-04	--	4E-05	--	2E-04
			Benzo(a)pyrene	1E-03	--	5E-04	--	2E-03
			Benzo(b)fluoranthene	1E-04	--	4E-05	--	1E-04
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	4E-06	--	2E-06	--	6E-06
			Chrysene	1E-06	--	4E-07	--	2E-06
			Dibenzo(a,h)anthracene	2E-04	--	8E-05	--	3E-04
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	5E-05	--	2E-05	--	7E-05
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	2E-03	--	7E-04	--	2E-03
		Exposure Point Total						2E-03
	Exposure Medium Total							2E-03

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	3E-10	--	--	3E-10
			Benzo(a)pyrene	--	3E-09	--	--	3E-09
			Benzo(b)fluoranthene	--	2E-10	--	--	2E-10
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	1E-10	--	--	1E-10
			Chrysene	--	3E-11	--	--	3E-11
			Dibenzo(a,h)anthracene	--	6E-10	--	--	6E-10
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	1E-10	--	--	1E-10

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Naphthalene	--	7E-06	--	--	7E-06
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	7E-06	--	--	7E-06
		Exposure Point Total						7E-06
	Exposure Medium Total							7E-06
Medium Total								2E-03
Receptor Total							Receptor Risk Total	2E-03

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	6E-09	--	1E-09	--	7E-09	NA	--	- -	--	--
			Benzo(a)pyrene	5E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-10	--	9E-11	--	5E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-09	--	2E-09	--	1E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-09	--	6E-10	--	3E-09	NA	--	- -	--	--
			Chemical Total	6E-08	--	2E-08	--	8E-08		--	--	--	--
		Exposure Point Total						8E-08					--
	Exposure Medium Total							8E-08					--
	Air	OU9	Benzo(a)anthracene	--	8E-11	--	--	8E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Chemical Total	--	1E-09	--	--	1E-09		- -	--	- -	--
		Exposure Point Total						1E-09					--
	Exposure Medium Total							1E-09					--
Medium Total								8E-08					--

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.004	- -	0.0008	0.005
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0002
			Benzo(a)anthracene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	--	0.00006	0.0003
			Benzo(k)fluoranthene	4E-09	--	1E-09	--	5E-09	NA	--	- -	--	--
			Chrysene	1E-09	--	3E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	6E-08	--	3E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0004	- -	0.00010	0.0005
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	5E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0006	- -	0.0002	0.0008
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.001	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0002	0.001
			Chemical Total	2E-06	--	5E-07	--	2E-06		0.009	--	0.002	0.01
		Exposure Point Total						2E-06					0.01
Exposure Medium Total								2E-06					0.01

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-08	--	--	2E-08	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-09	--	--	2E-09	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Chrysene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Naphthalene	--	8E-08	--	--	8E-08	Nasal	- -	0.1	- -	0.1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-07	--	--	1E-07		- -	0.1	- -	0.1
		Exposure Point Total						1E-07					0.1
	Exposure Medium Total							1E-07					0.1
Medium Total								2E-06					0.1
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0004
Total Body Weight HI	0.0008
Total Kidney HI	0.002
Total Liver HI	0.0008
Total Lungs HI	0.005
Total Nasal HI	0.1

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	4E-08	--	8E-09	--	5E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	7E-08	--	4E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	5E-10	--	3E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	1E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	3E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	9E-08	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-07					--
	Air	OU9	Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Chemical Total	--	4E-12	--	--	4E-12		- -	--	- -	--
		Exposure Point Total						4E-12					--
	Exposure Medium Total							4E-12					--
Medium Total								6E-07					--

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.003	--	0.0005	0.004
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00002	0.0001
			Benzo(a)anthracene	9E-07	--	2E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	1E-05	--	2E-06	--	1E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	8E-07	--	1E-07	--	9E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00003	0.0002
			Benzo(k)fluoranthene	3E-08	--	6E-09	--	4E-08	NA	--	- -	--	--
			Chrysene	9E-09	--	2E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.00006	0.0004
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.00003	0.0002
			Indeno(1,2,3-cd)pyrene	4E-07	--	7E-08	--	5E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0006	- -	0.00010	0.0007
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0009	- -	0.0002	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0007	- -	0.0001	0.0009
			Chemical Total	1E-05	--	2E-06	--	2E-05		0.008	--	0.0010	0.009
		Exposure Point Total						2E-05					0.009
Exposure Medium Total								2E-05					0.009

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-11	--	--	8E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Naphthalene	--	4E-07	--	--	4E-07	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-07	--	--	4E-07		- -	0.03	- -	0.03
		Exposure Point Total						4E-07					0.03
	Exposure Medium Total							4E-07					0.03
Medium Total								2E-05					0.04
Receptor Total							Receptor Risk Total	2E-05				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0003
Total Body Weight HI	0.0007
Total Kidney HI	0.002
Total Liver HI	0.0006
Total Lungs HI	0.004
Total Nasal HI	0.03

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	2E-07	--	5E-08	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-08	--	2E-08	--	9E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	6E-07	--	3E-06		--	--	--	--
		Exposure Point Total						3E-06					--
	Exposure Medium Total							3E-06					--
	Air	OU9	Benzo(a)anthracene	--	7E-14	--	--	7E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-14	--	--	4E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Chemical Total	--	8E-13	--	--	8E-13		- -	--	- -	--
		Exposure Point Total						8E-13					--
	Exposure Medium Total							8E-13					--
Medium Total								3E-06					--

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.004	- -	0.0008	0.004
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0002
			Benzo(a)anthracene	4E-06	--	1E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	4E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	3E-06	--	9E-07	--	4E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00006	0.0003
			Benzo(k)fluoranthene	1E-07	--	4E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0004	- -	0.0001	0.0005
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0006	- -	0.0002	0.0008
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0010	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0002	0.001
			Chemical Total	5E-05	--	2E-05	--	7E-05		0.008	--	0.002	0.010
		Exposure Point Total						7E-05					0.010
Exposure Medium Total								7E-05					0.010

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chrysene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Naphthalene	--	2E-08	--	--	2E-08	Nasal	- -	0.002	- -	0.002
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.002	- -	0.002
		Exposure Point Total						2E-08					0.002
	Exposure Medium Total							2E-08					0.002
Medium Total								7E-05					0.01
Receptor Total							Receptor Risk Total	7E-05				Receptor HI Total	0.01

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0004
Total Body Weight HI	0.0008
Total Kidney HI	0.002
Total Liver HI	0.0007
Total Lungs HI	0.004
Total Nasal HI	0.002

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Benzo(a)pyrene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	8E-10	--	2E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	6E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	5E-09	--	2E-09	--	7E-09	NA	--	- -	--	--
			Chemical Total	1E-07	--	4E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	OU9	Benzo(a)anthracene	--	5E-14	--	--	5E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	8E-14	--	--	8E-14	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Chemical Total	--	6E-13	--	--	6E-13		- -	--	- -	--
		Exposure Point Total						6E-13					--
	Exposure Medium Total							6E-13					--
Medium Total								2E-07					--

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.00007	- -	--	0.00007
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0002	- -	0.00005	0.0002
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.000007	- -	0.000002	0.000009
			Benzo(a)anthracene	3E-07	--	8E-08	--	3E-07	NA	--	- -	--	--
			Benzo(a)pyrene	3E-06	--	9E-07	--	4E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00001	- -	0.000004	0.00002
			Benzo(k)fluoranthene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chrysene	3E-09	--	8E-10	--	3E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-07	--	1E-07	--	7E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00002	- -	0.000006	0.00003
			Fluorene	- -	--	- -	--	- -	Blood	0.000010	- -	0.000003	0.00001
			Indeno(1,2,3-cd)pyrene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.00003	- -	0.000010	0.00004
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.00005	- -	0.00002	0.00007
			Pyrene	- -	--	- -	--	- -	Kidney	0.00004	- -	0.00001	0.00006
			Chemical Total	4E-06	--	1E-06	--	5E-06		0.0005	--	0.00010	0.0006
		Exposure Point Total						5E-06					0.0006
Exposure Medium Total								5E-06					0.0006

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chrysene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.0009	- -	0.0009
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.0009	- -	0.0009
		Exposure Point Total						3E-08					0.0009
	Exposure Medium Total							3E-08					0.0009
Medium Total								5E-06					0.001
Receptor Total							Receptor Risk Total	5E-06				Receptor HI Total	--

Total Blood HI	0.00002
Total Body Weight HI	0.00004
Total Kidney HI	0.0001
Total Liver HI	0.00004
Total Lungs HI	0.0002
Total Nasal HI	0.0009

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	6E-07	--	9E-08	--	7E-07	NA	--	- -	--	--
			Benzo(a)pyrene	6E-06	--	8E-07	--	6E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	6E-09	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	9E-07	--	1E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	3E-07	--	4E-08	--	3E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	1E-06	--	8E-06		--	--	--	--
		Exposure Point Total						8E-06					--
	Exposure Medium Total							8E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								8E-06					--

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.03	- -	0.004	0.04
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.001	- -	0.0002	0.001
			Benzo(a)anthracene	1E-05	--	2E-06	--	2E-05	NA	--	- -	--	--
			Benzo(a)pyrene	1E-04	--	2E-05	--	2E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-05	--	2E-06	--	1E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.002	- -	0.0003	0.002
			Benzo(k)fluoranthene	5E-07	--	7E-08	--	5E-07	NA	--	- -	--	--
			Chrysene	1E-07	--	2E-08	--	2E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-05	--	4E-06	--	3E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.003	- -	0.0005	0.004
			Fluorene	- -	--	- -	--	- -	Blood	0.002	- -	0.0002	0.002
			Indeno(1,2,3-cd)pyrene	6E-06	--	8E-07	--	6E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.006	- -	0.0008	0.006
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.009	- -	0.001	0.01
			Pyrene	- -	--	- -	--	- -	Kidney	0.007	- -	0.001	0.008
			Chemical Total	2E-04	--	3E-05	--	2E-04		0.08	--	0.008	0.08
		Exposure Point Total						2E-04					0.08
Exposure Medium Total								2E-04					0.08

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	3E-07	--	--	3E-07	Nasal	- -	0.1	- -	0.1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.1	- -	0.1
		Exposure Point Total						3E-07					0.1
	Exposure Medium Total							3E-07					0.1
Medium Total								2E-04					0.2
Receptor Total							Receptor Risk Total	2E-04				Receptor HI Total	0.2

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	0.003
Total Body Weight HI	0.006
Total Kidney HI	0.02
Total Liver HI	0.006
Total Lungs HI	0.04
Total Nasal HI	0.1

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	6E-08	--	9E-09	--	7E-08	NA	--	- -	--	--
			Benzo(a)pyrene	5E-07	--	7E-08	--	6E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-09	--	6E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-08	--	1E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	3E-09	--	3E-08	NA	--	- -	--	--
			Chemical Total	7E-07	--	1E-07	--	8E-07		--	--	--	--
		Exposure Point Total						8E-07					--
	Exposure Medium Total							8E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								8E-07					--

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.004	- -	0.0004	0.004
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00002	0.0001
			Benzo(a)anthracene	1E-06	--	2E-07	--	1E-06	NA	--	- -	--	--
			Benzo(a)pyrene	1E-05	--	2E-06	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-06	--	2E-07	--	1E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00003	0.0002
			Benzo(k)fluoranthene	4E-08	--	6E-09	--	5E-08	NA	--	- -	--	--
			Chrysene	1E-08	--	2E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	3E-07	--	3E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0004	- -	0.00005	0.0004
			Fluorene	- -	--	- -	--	- -	Blood	0.0002	- -	0.00003	0.0002
			Indeno(1,2,3-cd)pyrene	5E-07	--	7E-08	--	6E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0006	- -	0.00009	0.0007
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0010	- -	0.0001	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0001	0.0009
			Chemical Total	2E-05	--	3E-06	--	2E-05		0.008	--	0.0009	0.009
		Exposure Point Total						2E-05					0.009
Exposure Medium Total								2E-05					0.009

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.1	- -	0.1
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.1	- -	0.1
		Exposure Point Total						1E-06					0.1
	Exposure Medium Total							1E-06					0.1
Medium Total								2E-05					0.1
Receptor Total							Receptor Risk Total	2E-05				Receptor HI Total	0.1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0003
Total Body Weight HI	0.0007
Total Kidney HI	0.002
Total Liver HI	0.0007
Total Lungs HI	0.004
Total Nasal HI	0.1

RAGS TABLES 7 and 9

EPCS Weighted 95% for samples without ash/burnt material

and

5% for samples with ash/burnt material

LIST OF TABLES
RAGS PART D TABLE 7
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Table No.	
	REASONABLE MAXIMUM EXPOSURES
7.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
7.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
7.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
7.5.RME	Child Residents - Entire Site Surface/Subsurface Soil
7.6.RME	Adult Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
7.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
7.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
7.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
7.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
7.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
7.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	2.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	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)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	1.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-09	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	3.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-08	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-09	7.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.1E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	9.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.0E-09	6.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	8.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-08	6.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	6.5E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.7E-10	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	9.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	4.0E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-09	2.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.3E-08					--
		Exposure Point Total									3.0E-07					--
	Exposure Medium Total										3.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	6.2E-7	mg/m^3	1.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-10	8.5E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.5E-7	mg/m^3	1.1E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-09	7.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.2E-7	mg/m^3	8.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.0E-11	5.7E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.1E-8	mg/m^3	1.8E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.1E-10	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.6E-7	mg/m^3	5.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.6E-11	3.5E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.7E-09					--
		Exposure Point Total									1.7E-09					--
	Exposure Medium Total										1.7E-09					--
Medium Total											3.0E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	6.9E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				2-Methylnaphthalene	17.0	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.008
				Acenaphthylene	3	mg/kg	9.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	5	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.5E-08	9.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	1.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-06	9.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.3E-08	7.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	8.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	1.7	mg/kg	4.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.4E-09	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	1.3E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	9.3E-10	8.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	2.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	2.9	mg/kg	8.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	5.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-08	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0005
				Phenanthrene	12	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0008
				Pyrene	10	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.9E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0006
			Exp. Route Total								1.4E-06					0.01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17.0	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3	mg/kg	3.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00004
				Benzo(a)anthracene	5	mg/kg	5.1E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-08	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	5.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	4.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-08	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00007
				Benzo(k)fluoranthene	1.7	mg/kg	1.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-09	1.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	5.0E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.6E-10	3.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	9.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.9E-08	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	6.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	2.9	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	1.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	5.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	12	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	10	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								5.5E-07					0.004
		Exposure Point Total									2.0E-06					0.02
	Exposure Medium Total										2.0E-06					0.02
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.7E-7	mg/m^3	3.4E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	1.3E-03	mg/m^3	2.6E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	3.3E-6	mg/m^3	6.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.1E-10	4.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-6	mg/m^3	6.8E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.5E-09	4.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.9E-6	mg/m^3	5.6E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.2E-10	3.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	2.0E-6	mg/m^3	4.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.2E-6	mg/m^3	2.3E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-10	1.6E-07	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	3.2E-6	mg/m^3	6.3E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	6.9E-11	4.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	6.1E-7	mg/m^3	1.2E-09	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-09	8.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	4.5E-6	mg/m^3	8.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.8E-5	mg/m^3	9.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.4E-6	mg/m^3	2.7E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-10	1.9E-07	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.9E-04	mg/m^3	9.5E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.2E-08	6.7E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.02
				Phenanthrene	6.6E-4	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	6.9E-6	mg/m^3	1.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.5E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.3E-08					0.02
		Exposure Point Total									4.3E-08					0.02
	Exposure Medium Total										4.3E-08					0.02
Medium Total											2.0E-06					0.04
										Total of Receptor Risks Across All Media	2.3E-06				Total of Receptor Hazards Across All Media	0.04

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	8.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	7.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	2.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.5E-08	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	4.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-08	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.7E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	7.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	2.4E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-06	6.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	1.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.3E-08	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	3.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.1E-08	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								2.3E-06					--
		Exposure Point Total									5.0E-06					--
	Exposure Medium Total										5.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	7.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.5E-13	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	6.9E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.6E-12	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	5.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-13	1.5E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	1.1E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.4E-12	3.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	3.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-13	9.0E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.1E-11					--
		Exposure Point Total									1.1E-11					--
	Exposure Medium Total										1.1E-11					--
Medium Total											5.0E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	8.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0008
				2-Methylnaphthalene	17	mg/kg	5.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	3.3	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00005
				Benzo(a)anthracene	4.7	mg/kg	1.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	4.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-05	4.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00009
				Benzo(k)fluoranthene	1.7	mg/kg	5.9E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.3E-08	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	1.6E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.2E-08	4.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	3.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-06	8.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	2.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Fluorene	2.9	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00007
				Indeno(1,2,3-cd)pyrene	2	mg/kg	7.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.1E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.9E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	12	mg/kg	4.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
				Pyrene	9.9	mg/kg	3.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.7E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
			Exp. Route Total								1.8E-05					0.006

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	3.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.003
				Acenaphthylene	3.3	mg/kg	9.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.8E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00005
				Benzo(a)anthracene	4.7	mg/kg	1.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-06	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	1.5E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05	4.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.0E-07	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	8.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00008
				Benzo(k)fluoranthene	1.7	mg/kg	5.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.7E-08	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	1.4E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.0E-08	3.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	2.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.9E-06	7.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	1.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	2.9	mg/kg	8.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00006
				Indeno(1,2,3-cd)pyrene	2	mg/kg	6.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.4E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	12	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	9.9	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
			Exp. Route Total								1.5E-05					0.004
		Exposure Point Total									3.3E-05					0.01
	Exposure Medium Total										3.3E-05					0.01
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	2.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	2.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	1.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	4.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-12	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	4.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.8E-11	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	3.6E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.9E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	2.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	1.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-12	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	4.0E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	4.4E-13	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	7.6E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	9.1E-12	2.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	5.6E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	7.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	4.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	7.5E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.5E-07	2.1E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.007
				Phenanthrene	1.2E-4	mg/m^3	1.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	8.6E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.5E-07					0.007
		Exposure Point Total									2.5E-07					0.007
	Exposure Medium Total										2.5E-07					0.007
Medium Total											3.3E-05					0.02
										Total of Receptor Risks Across All Media	3.8E-05				Total of Receptor Hazards Across All Media	0.02

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	7.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.4E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	6.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.8E-06	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	5.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.7E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.9E-07	2.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	6.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.4E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	5.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	3.6E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-08	8.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	7.9E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-07	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.7E-06					--
		Exposure Point Total									1.1E-05					--
	Exposure Medium Total										1.1E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	2.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.2E-13	4.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	1.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.9E-12	3.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	1.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-13	2.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	2.9E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	3.5E-13	6.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	8.2E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	9.1E-14	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.7E-12					--
		Exposure Point Total									2.7E-12					--
	Exposure Medium Total										2.7E-12					--
Medium Total											1.1E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	3.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.002
				2-Methylnaphthalene	17.0	mg/kg	2.7E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.008
				Acenaphthylene	3	mg/kg	5.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.0E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0001
				Benzo(a)anthracene	5	mg/kg	3.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-06	8.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	4.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-05	9.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	3.4E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.5E-06	7.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	4.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Benzo(k)fluoranthene	1.7	mg/kg	1.4E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.0E-07	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	3.8E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.8E-08	8.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	7.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.3E-06	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	1.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Fluorene	2.9	mg/kg	4.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	7.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.1E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0005
				Phenanthrene	12	mg/kg	1.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0007
				Pyrene	10	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0006
			Exp. Route Total								4.2E-05					0.01

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17.0	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.004
				Acenaphthylene	3	mg/kg	3.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00007
				Benzo(a)anthracene	5	mg/kg	2.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-06	6.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	3.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-05	6.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	2.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-06	5.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
				Benzo(k)fluoranthene	1.7	mg/kg	1.0E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.5E-08	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	2.8E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-08	6.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	5.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-06	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	7.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Fluorene	2.9	mg/kg	3.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00010
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	1.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-07	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	5.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0003
				Phenanthrene	12	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0005
				Pyrene	10	mg/kg	1.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
			Exp. Route Total								3.1E-05					0.006
		Exposure Point Total									7.3E-05					0.02
	Exposure Medium Total										7.3E-05					0.02
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	1.0E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	9.7E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	9.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.1E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	1.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-12	2.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	1.1E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.2E-11	2.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	9.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-12	2.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	1.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	3.8E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-13	8.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	1.0E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.1E-13	2.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	1.9E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.3E-12	4.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	2.7E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	3.4E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.0E-07	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	4.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.9E-13	9.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	3.6E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.2E-08	4.2E-06	(mg/m^3)	3.0E-03	(mg/m^3)	0.001
				Phenanthrene	1.2E-4	mg/m^3	4.9E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	4.1E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.2E-08					0.001
		Exposure Point Total									1.2E-08					0.001
	Exposure Medium Total										1.2E-08					0.001
Medium Total											7.3E-05					0.02
										Total of Receptor Risks Across All Media	8.5E-05				Total of Receptor Hazards Across All Media	0.02

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	5.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-08	9.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.7E-07	8.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	3.8E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.8E-09	6.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	8.3E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-08	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-08	3.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.9E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	5.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-08	9.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.2E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.8E-07	8.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	4.0E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	6.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	8.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.3E-08	1.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-08	3.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
		Exp. Route Total									5.1E-07					--
		Exposure Point Total									1.0E-06					--
	Exposure Medium Total										1.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	1.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-13	2.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	1.3E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.4E-12	2.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	9.6E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	1.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	2.1E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.5E-13	3.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	5.9E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.5E-14	9.4E-13	(mg/m^3)	NA	(mg/m^3)	--
		Exp. Route Total									2.0E-12					--
		Exposure Point Total									2.0E-12					--
	Exposure Medium Total										2.0E-12					--
Medium Total											1.0E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	8.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-08	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00008
				2-Methylnaphthalene	17	mg/kg	5.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0004
				Acenaphthylene	3.3	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000006
				Benzo(a)anthracene	4.7	mg/kg	3.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.2E-07	4.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	3.2E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.3E-06	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	2.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000010
				Benzo(k)fluoranthene	1.7	mg/kg	1.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.9E-09	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	2.9E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.1E-09	4.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	5.6E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-07	8.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	2.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.5E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Fluorene	2.9	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000007
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.3E-08	2.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Phenanthrene	12	mg/kg	4.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
				Pyrene	9.9	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00003
			Exp. Route Total								3.3E-06					0.0007

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0003
				Acenaphthylene	3.3	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.5E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000006
				Benzo(a)anthracene	4.7	mg/kg	3.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	5.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	3.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-06	5.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	2.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-07	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
				Benzo(k)fluoranthene	1.7	mg/kg	1.1E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.2E-09	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	3.1E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.2E-09	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	5.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-07	9.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Fluorene	2.9	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000008
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-08	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.3E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Phenanthrene	12	mg/kg	4.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
				Pyrene	9.9	mg/kg	3.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00003
			Exp. Route Total								3.4E-06					0.0005
		Exposure Point Total									6.6E-06					0.001
	Exposure Medium Total										6.6E-06					0.001
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	2.2E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	2.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.9E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	1.9E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.5E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	7.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.2E-13	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	8.0E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	8.8E-12	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	6.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.2E-13	1.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	2.5E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	2.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.0E-13	4.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	7.3E-12	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	8.1E-14	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	1.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-12	2.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	5.6E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	7.1E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	3.2E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-13	5.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	7.5E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.5E-08	2.2E-06	(mg/m^3)	3.0E-03	(mg/m^3)	0.0007
				Phenanthrene	1.2E-4	mg/m^3	1.0E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	8.6E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.5E-08					0.0007
		Exposure Point Total									2.5E-08					0.0007
	Exposure Medium Total										2.5E-08					0.0007
Medium Total											- -					--
										Total of Receptor Risks Across All Media	7.7E-06			Total of Receptor Hazards Across All Media	--

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	5.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-06	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.6E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.4E-05	1.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	3.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.6E-07	7.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	7.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-06	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.2E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-06	4.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.5E-05					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	1.9E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-06	4.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.7E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-05	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	1.3E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.3E-08	2.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	6.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	7.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.7E-07	1.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-05					--
		Exposure Point Total									6.1E-05					--
	Exposure Medium Total										6.1E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	4.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.6E-12	9.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	3.7E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.1E-11	8.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	2.8E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	6.1E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.3E-12	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	1.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.9E-12	3.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.8E-11					--
		Exposure Point Total									5.8E-11					--
	Exposure Medium Total										5.8E-11					--
Medium Total											6.1E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	2.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.2E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.01
				2-Methylnaphthalene	17	mg/kg	1.9E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-04	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.05
				Acenaphthylene	3.3	mg/kg	3.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0007
				Benzo(a)anthracene	4.7	mg/kg	2.7E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.0E-05	6.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	2.9E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.1E-04	6.4E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	2.4E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-05	5.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
				Benzo(k)fluoranthene	1.7	mg/kg	9.9E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.3E-07	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	2.7E-05	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	5.1E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.7E-05	1.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	7.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.002
				Fluorene	2.9	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0009
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.2E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.5E-06	2.6E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	5.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.003
				Phenanthrene	12	mg/kg	1.3E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.005
				Pyrene	9.9	mg/kg	1.1E-05	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-04	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.004
			Exp. Route Total								3.0E-04					0.08

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	5.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.1E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	3.3	mg/kg	1.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0003
				Benzo(a)anthracene	4.7	mg/kg	1.0E-05	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.3E-06	2.2E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	1.1E-05	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.8E-05	2.3E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	8.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.4E-06	1.9E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
				Benzo(k)fluoranthene	1.7	mg/kg	3.6E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.6E-07	7.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	9.8E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.1E-08	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	1.9E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.4E-05	4.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	2.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.0E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Fluorene	2.9	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	2	mg/kg	4.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-06	9.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	2.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	12	mg/kg	4.8E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.6E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	9.9	mg/kg	3.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.6E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
			Exp. Route Total								1.1E-04					0.02
		Exposure Point Total									4.1E-04					0.1
	Exposure Medium Total										4.1E-04					0.1
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	2.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	2.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	1.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	2.2E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-11	4.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	2.3E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.6E-10	5.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	1.9E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-11	4.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	2.5E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	8.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.7E-12	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	2.2E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.4E-12	4.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	4.1E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.9E-11	8.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	5.6E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	7.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	9.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	7.5E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	2.6E-07	8.8E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.03
				Phenanthrene	1.2E-4	mg/m^3	1.0E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	8.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.6E-07					0.03
		Exposure Point Total									2.6E-07					0.03
	Exposure Medium Total										2.6E-07					0.03
Medium Total											4.1E-04					0.1
										Total of Receptor Risks Across All Media	4.7E-04				Total of Receptor Hazards Across All Media	0.1

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	7.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	6.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	5.2E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.8E-08	8.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.1E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	8.2E-07	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	5.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.6E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	4.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-07	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	3.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.6E-06	5.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	2.7E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-08	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	5.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-07	9.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	1.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-07	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.4E-06					--
		Exposure Point Total									1.0E-05					--
	Exposure Medium Total										1.0E-05					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	5.7E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.3E-12	9.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	5.1E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.6E-11	8.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	3.9E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.2E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	8.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.0E-11	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	2.4E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-12	3.8E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								7.9E-11					--
		Exposure Point Total									7.9E-11					--
	Exposure Medium Total										7.9E-11					--
Medium Total											1.0E-05					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.4E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.001
				2-Methylnaphthalene	17	mg/kg	8.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.006
				Acenaphthylene	3.3	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00008
				Benzo(a)anthracene	4.7	mg/kg	4.0E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-06	6.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	4.3E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.1E-05	6.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	3.5E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-06	5.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
				Benzo(k)fluoranthene	1.7	mg/kg	1.5E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	4.0E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.9E-08	6.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	7.5E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-06	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	3.0E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0002
				Fluorene	2.9	mg/kg	1.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00010
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	2.3E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.8E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0003
				Phenanthrene	12	mg/kg	5.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0005
				Pyrene	9.9	mg/kg	4.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0005
			Exp. Route Total								4.4E-05					0.009

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	3.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.3E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3.3	mg/kg	8.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00004
				Benzo(a)anthracene	4.7	mg/kg	2.1E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-06	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	2.2E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.6E-05	3.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	1.8E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	7.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00007
				Benzo(k)fluoranthene	1.7	mg/kg	7.6E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.5E-08	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	2.1E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	3.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.8E-06	6.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	1.6E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0001
				Fluorene	2.9	mg/kg	7.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	2	mg/kg	8.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.5E-07	1.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.6E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	12	mg/kg	2.9E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0003
				Pyrene	9.9	mg/kg	2.4E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.0E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								2.3E-05					0.003
		Exposure Point Total									6.7E-05					0.01
	Exposure Medium Total										6.7E-05					0.01
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	8.8E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	8.2E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.4E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	7.7E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.2E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	3.0E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.3E-11	4.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	3.2E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.5E-10	5.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	2.6E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.9E-11	4.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	1.0E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	1.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-11	1.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	3.0E-10	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.3E-12	4.7E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	5.6E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.7E-11	8.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	2.2E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.5E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	2.9E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	1.3E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-11	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	3.0E-05	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.0E-06	8.8E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.03
				Phenanthrene	1.2E-4	mg/m^3	4.1E-05	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-04	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	3.5E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-09	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.0E-06					0.03
		Exposure Point Total									1.0E-06					0.03
	Exposure Medium Total										1.0E-06					0.03
Medium Total											6.8E-05					0.04
										Total of Receptor Risks Across All Media	7.8E-05				Total of Receptor Hazards Across All Media	0.04

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	6.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.5E-09	4.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.0E-08	3.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	4.2E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.0E-10	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	9.0E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-09	6.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-09	1.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.3E-08					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	1.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-09	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	9.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	1.1E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.9E-11	7.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	2.3E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-09	1.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	6.7E-10	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.9E-10	4.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.4E-08					--
		Exposure Point Total									6.7E-08					--
	Exposure Medium Total										6.7E-08					--
	Air	OU9	Inhalation	Benzo(a)anthracene	6.2E-7	mg/m^3	6.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.7E-11	4.3E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.5E-7	mg/m^3	5.4E-10	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	5.9E-10	3.8E-08	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	4.2E-7	mg/m^3	4.1E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.5E-11	2.9E-08	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.1E-8	mg/m^3	8.9E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.1E-10	6.2E-09	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.6E-7	mg/m^3	2.5E-10	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-11	1.8E-08	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.4E-10					--
		Exposure Point Total									8.4E-10					--
	Exposure Medium Total										8.4E-10					--
Medium Total											6.8E-08					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	1.7E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				2-Methylnaphthalene	17.0	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.2E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3	mg/kg	2.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	5	mg/kg	3.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-08	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	3.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-07	2.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	2.8E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Benzo(k)fluoranthene	1.7	mg/kg	1.2E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	8.6E-10	8.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	3.2E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.3E-10	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	6.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.4E-08	4.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00008
				Fluorene	2.9	mg/kg	2.0E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00004
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	9.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	3.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	12	mg/kg	8.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	10	mg/kg	6.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								3.5E-07					0.003

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17.0	mg/kg	2.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0004
				Acenaphthylene	3	mg/kg	5.9E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000007
				Benzo(a)anthracene	5	mg/kg	8.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.2E-09	5.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	9.0E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.6E-08	6.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	7.4E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.4E-09	5.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	5.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
				Benzo(k)fluoranthene	1.7	mg/kg	3.1E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.2E-10	2.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	8.3E-09	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	6.0E-11	5.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	1.6E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	1.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Fluorene	2.9	mg/kg	5.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000009
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	3.6E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	9.0E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.3E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Phenanthrene	12	mg/kg	2.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Pyrene	10	mg/kg	1.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
			Exp. Route Total								9.2E-08					0.0006
		Exposure Point Total									4.4E-07					0.004
	Exposure Medium Total										4.4E-07					0.004
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	1.7E-7	mg/m^3	1.7E-10	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	1.3E-03	mg/m^3	1.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	9.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	1.2E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	3.3E-6	mg/m^3	3.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.5E-10	2.3E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	3.5E-6	mg/m^3	3.4E-09	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.8E-09	2.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	2.9E-6	mg/m^3	2.8E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.1E-10	2.0E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	2.0E-6	mg/m^3	2.0E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.2E-6	mg/m^3	1.2E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.3E-10	8.1E-08	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	3.2E-6	mg/m^3	3.1E-09	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	3.5E-11	2.2E-07	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	6.1E-7	mg/m^3	6.0E-10	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	7.1E-10	4.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	4.5E-6	mg/m^3	4.4E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.1E-07	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	4.8E-5	mg/m^3	4.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.3E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	1.4E-6	mg/m^3	1.4E-09	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	9.6E-08	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	4.9E-04	mg/m^3	4.8E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	1.6E-08	3.3E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.01
				Phenanthrene	6.6E-4	mg/m^3	6.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	6.9E-6	mg/m^3	6.8E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.7E-07	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.2E-08					0.01
		Exposure Point Total									2.2E-08					0.01
	Exposure Medium Total										2.2E-08					0.01
Medium Total											4.7E-07					0.01
										Total of Receptor Risks Across All Media	5.3E-07				Total of Receptor Hazards Across All Media	0.01

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	4.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.6E-08	3.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	3.3E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.4E-09	2.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	7.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-08	5.6E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.0E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-08	1.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.2E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	8.4E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.1E-09	6.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	7.5E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.5E-08	5.8E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	5.7E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.1E-10	4.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.0E-09	9.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-09	2.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								7.3E-08					--
		Exposure Point Total									5.0E-07					--
	Exposure Medium Total										5.0E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	2.4E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.7E-13	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	2.2E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.4E-12	1.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	1.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-13	1.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	3.6E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.3E-13	2.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	1.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-13	7.9E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.4E-12					--
		Exposure Point Total									3.4E-12					--
	Exposure Medium Total										3.4E-12					--
Medium Total											5.0E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	1.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				2-Methylnaphthalene	17	mg/kg	9.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3.3	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00002
				Benzo(a)anthracene	4.7	mg/kg	2.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-07	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	2.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-07	1.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
				Benzo(k)fluoranthene	1.7	mg/kg	9.4E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	6.8E-09	7.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	2.5E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.9E-09	2.0E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00007
				Fluorene	2.9	mg/kg	1.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.0E-08	8.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	2.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	12	mg/kg	6.6E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	9.9	mg/kg	5.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0001
			Exp. Route Total								2.8E-06					0.003

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	1.2E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.6E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0002
				Acenaphthylene	3.3	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.4E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000004
				Benzo(a)anthracene	4.7	mg/kg	4.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.2E-08	3.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	4.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	3.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-08	3.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000007
				Benzo(k)fluoranthene	1.7	mg/kg	1.6E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.2E-09	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	4.3E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.2E-10	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	8.2E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.0E-08	6.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	6.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.7E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00001
				Fluorene	2.9	mg/kg	2.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000005
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	4.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.7E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00002
				Phenanthrene	12	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.8E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00003
				Pyrene	9.9	mg/kg	9.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00002
			Exp. Route Total								4.8E-07					0.0003
		Exposure Point Total									3.3E-06					0.003
	Exposure Medium Total										3.3E-06					0.003
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	6.9E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	0.000	mg/m^3	6.4E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	6.0E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.7E-06	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	1.3E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	1.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	1.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.5E-11	1.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	1.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-12	8.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	8.0E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.2E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	4.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.1E-13	3.6E-11	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	1.3E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	1.4E-13	9.8E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	2.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.9E-12	1.9E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	1.8E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	2.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	5.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.0E-13	4.3E-11	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	0.000	mg/m^3	2.4E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	8.0E-08	1.8E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.006
				Phenanthrene	1.2E-4	mg/m^3	3.2E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	2.7E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.1E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								8.0E-08					0.006
		Exposure Point Total									8.0E-08					0.006
	Exposure Medium Total										8.0E-08					0.006
Medium Total											3.4E-06					0.009
										Total of Receptor Risks Across All Media	3.9E-06				Total of Receptor Hazards Across All Media	0.009

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	1.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-07	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	1.6E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.2E-06	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	1.3E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.1E-09	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	2.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-07	5.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	7.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-08	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.6E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	5.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.9E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	4.8E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.5E-07	1.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.00	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.60	mg/kg	3.6E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.7E-09	8.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	7.9E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-08	1.7E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	4.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								4.7E-07					--
		Exposure Point Total									2.1E-06					--
	Exposure Medium Total										2.1E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	5.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.5E-14	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	4.4E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	4.8E-13	9.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	3.3E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.7E-14	7.3E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	7.2E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	8.7E-14	1.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	2.1E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.3E-14	4.5E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.8E-13					--
		Exposure Point Total									6.8E-13					--
	Exposure Medium Total										6.8E-13					--
Medium Total											2.1E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	9.8E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				2-Methylnaphthalene	17	mg/kg	6.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.8E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3.3	mg/kg	1.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	4.7	mg/kg	9.8E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.2E-07	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	1.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.6E-06	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	8.6E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.2E-07	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
				Benzo(k)fluoranthene	1.7	mg/kg	3.5E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.6E-08	7.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	9.6E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	7.0E-09	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	1.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.3E-06	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	2.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00007
				Fluorene	2.9	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Indeno(1,2,3-cd)pyrene	2	mg/kg	4.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.0E-07	9.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	2.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.3E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	12	mg/kg	4.7E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	9.9	mg/kg	3.9E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								1.1E-05					0.003

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.000	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.7E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0004
				Acenaphthylene	3.3	mg/kg	3.8E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.4E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000007
				Benzo(a)anthracene	4.7	mg/kg	2.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-07	6.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	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)	--
				Benzo(b)fluoranthene	4.1	mg/kg	2.5E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	3.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
				Benzo(k)fluoranthene	1.7	mg/kg	1.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.5E-09	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	2.8E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.0E-09	6.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	5.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	7.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.5E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00002
				Fluorene	2.9	mg/kg	3.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.9E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000010
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.2E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	8.9E-08	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	5.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.6E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00003
				Phenanthrene	12	mg/kg	1.4E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00005
				Pyrene	9.9	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
			Exp. Route Total								3.1E-06					0.0006
		Exposure Point Total									1.4E-05					0.004
	Exposure Medium Total										1.4E-05					0.004
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	2.6E-14	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	2.4E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.8E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	2.3E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.7E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	2.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.9E-13	5.7E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	2.8E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.1E-12	6.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	2.3E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.5E-13	5.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	3.0E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	3.5E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	9.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.0E-13	2.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	2.6E-12	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.8E-14	5.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	4.8E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	5.8E-13	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	6.7E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	8.6E-09	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.0E-07	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	1.1E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-13	2.4E-12	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	9.0E-08	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	3.1E-09	1.0E-06	(mg/m^3)	3.0E-03	(mg/m^3)	0.0003
				Phenanthrene	1.2E-4	mg/m^3	1.2E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-06	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	1.0E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.2E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								3.1E-09					0.0003
		Exposure Point Total									3.1E-09					0.0003
	Exposure Medium Total										3.1E-09					0.0003
Medium Total											1.4E-05					0.004
										Total of Receptor Risks Across All Media	1.6E-05				Total of Receptor Hazards Across All Media	0.004

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	1.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.0E-08	2.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	7.9E-1	mg/kg	1.3E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	9.2E-08	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	6.0E-1	mg/kg	9.6E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	7.0E-10	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	2.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-08	3.3E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	3.7E-1	mg/kg	5.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-09	9.4E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								1.2E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	4.2E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-09	6.7E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	7.9E-1	mg/kg	3.7E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.7E-08	6.0E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	6.0E-1	mg/kg	2.8E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.1E-10	4.5E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.130	mg/kg	6.2E-10	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.5E-09	9.8E-10	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	3.7E-1	mg/kg	1.8E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-09	2.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								3.6E-08					--
		Exposure Point Total									1.6E-07					--
	Exposure Medium Total										1.6E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	3.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	3.9E-14	5.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	3.1E-13	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	3.5E-13	5.0E-13	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	2.4E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.6E-14	3.8E-13	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	5.2E-14	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	6.2E-14	8.2E-14	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	1.5E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.6E-14	2.3E-13	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								4.9E-13					--
		Exposure Point Total									4.9E-13					--
	Exposure Medium Total										4.9E-13					--
Medium Total											1.6E-07					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	2.5E-1	mg/kg	2.2E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.4E-09	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.00002
				2-Methylnaphthalene	17.0	mg/kg	1.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.3E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0001
				Acenaphthylene	3	mg/kg	2.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.4E-08	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000001
				Benzo(a)anthracene	5	mg/kg	7.5E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.5E-08	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	8.0E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.8E-07	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4	mg/kg	6.6E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-08	1.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-08	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000002
				Benzo(k)fluoranthene	1.7	mg/kg	2.7E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-09	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	7.4E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	5.4E-10	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	1.4E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-07	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	5.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.6E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000004
				Fluorene	2.9	mg/kg	2.5E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.4E-08	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000002
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	3.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	5.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	4.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.3E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.000006
				Phenanthrene	12	mg/kg	1.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00001
				Pyrene	10	mg/kg	8.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000008
			Exp. Route Total								8.1E-07					0.0002

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0.0E+0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	2.5E-1	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17.0	mg/kg	3.4E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.9E-08	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.00002
				Acenaphthylene	3	mg/kg	8.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.5E-08	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0000004
				Benzo(a)anthracene	5	mg/kg	2.2E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-08	3.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	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)	--
				Benzo(b)fluoranthene	4	mg/kg	1.9E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	3.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	7.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-08	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0000007
				Benzo(k)fluoranthene	1.7	mg/kg	8.1E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.9E-10	1.3E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	5	mg/kg	2.2E-08	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	1.6E-10	3.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.9	mg/kg	4.1E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-08	6.6E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6	mg/kg	1.7E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.8E-08	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000001
				Fluorene	2.9	mg/kg	7.5E-09	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.2E-08	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0000005
				Indeno(1,2,3-cd)pyrene	2.0	mg/kg	9.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-09	1.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	1.3E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.8E-08	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.000002
				Phenanthrene	12	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	9.0E-08	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000003
				Pyrene	10	mg/kg	2.6E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-08	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000002
			Exp. Route Total								2.4E-07					0.00003
		Exposure Point Total									1.1E-06					0.0002
	Exposure Medium Total										1.1E-06					0.0002
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	0.0E+00	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	5.4E-14	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-13	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	5.1E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-06	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	4.7E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	1.9E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.1E-13	3.0E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	2.0E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	2.2E-12	3.2E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	1.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.8E-13	2.6E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	6.3E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.8E-12	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	6.8E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.4E-14	1.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	1.8E-12	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	2.0E-14	2.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	3.5E-13	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	4.2E-13	5.5E-13	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	1.4E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.1E-12	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	1.8E-08	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.2E-08	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	8.0E-13	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.8E-14	1.3E-12	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	1.9E-07	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	6.4E-09	5.5E-07	(mg/m^3)	3.0E-03	(mg/m^3)	0.0002
				Phenanthrene	1.2E-4	mg/m^3	2.5E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	7.4E-07	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	2.2E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.3E-12	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								6.4E-09					0.0002
		Exposure Point Total									6.4E-09					0.0002
	Exposure Medium Total										6.4E-09					0.0002
Medium Total											1.1E-06					0.0004
										Total of Receptor Risks Across All Media	1.2E-06				Total of Receptor Hazards Across All Media	--

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	7.1E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-07	3.8E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	6.3E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.6E-06	3.4E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	4.8E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.5E-08	2.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.5E-07	5.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.9E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-07	1.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								6.1E-06					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	1.0E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	7.5E-08	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	9.1E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-07	4.9E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	6.9E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	5.1E-09	3.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.5E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-07	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	4.3E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-08	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.9E-07					--
		Exposure Point Total									7.0E-06					--
	Exposure Medium Total										7.0E-06					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	1.1E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.2E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	1.0E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	1.1E-11	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	7.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	8.4E-13	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	1.7E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	2.0E-12	8.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	4.7E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.2E-13	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.6E-11					--
		Exposure Point Total									1.6E-11					--
	Exposure Medium Total										1.6E-11					--
Medium Total											7.0E-06					--
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	3.1E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.1E-06	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.004
				2-Methylnaphthalene	17	mg/kg	2.1E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.3E-05	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.02
				Acenaphthylene	3.3	mg/kg	4.0E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.4E-05	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.0002
				Benzo(a)anthracene	4.7	mg/kg	3.7E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-06	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	4.0E-06	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	2.9E-05	2.1E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	3.3E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.4E-06	1.8E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0004
				Benzo(k)fluoranthene	1.7	mg/kg	1.3E-06	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	9.9E-08	7.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	3.7E-06	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	2.7E-08	2.0E-05	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	6.9E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06	3.7E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	7.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.7E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0007
				Fluorene	2.9	mg/kg	3.5E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.2E-05	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.0003
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.6E-06	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06	8.5E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	6.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-05	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.001
				Phenanthrene	12	mg/kg	1.5E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	5.1E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.002
				Pyrene	9.9	mg/kg	1.2E-06	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.2E-05	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.001
			Exp. Route Total								4.0E-05					0.03

TABLE 7.5.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	2.3E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	8.1E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3.3	mg/kg	5.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	2.1E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	4.7	mg/kg	5.4E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-07	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	5.8E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.2E-06	3.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	4.7E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-07	2.6E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	5.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00006
				Benzo(k)fluoranthene	1.7	mg/kg	2.0E-07	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	1.4E-08	1.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	5.3E-07	(mg/kg/day)	7.3E-03	$(mg/kg/day)^{-1}$	3.9E-09	2.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	1.0E-07	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	7.3E-07	5.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	1.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	4.0E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00010
				Fluorene	2.9	mg/kg	5.2E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	1.8E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00005
				Indeno(1,2,3-cd)pyrene	2	mg/kg	2.3E-07	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.7E-07	1.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	8.9E-08	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	3.1E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0002
				Phenanthrene	12	mg/kg	2.1E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	7.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	9.9	mg/kg	1.8E-07	(mg/kg/day)	NA	$(mg/kg/day)^{-1}$	- -	6.2E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								5.9E-06					0.003
		Exposure Point Total									4.6E-05					0.03
	Exposure Medium Total										4.6E-05					0.03
	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	4.9E-13	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	4.5E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	4.3E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	6.0E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	6.6E-12	3.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	6.4E-11	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	7.0E-11	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	5.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	5.7E-12	2.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	5.7E-12	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.4E-12	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	5.8E-11	(mg/m^3)	1.1E-05	$(ug/m^3)^{-1}$	6.4E-13	3.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	1.1E-11	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.3E-11	6.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	1.3E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	4.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	1.6E-07	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	5.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	2.5E-11	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	2.8E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	1.7E-06	(mg/m^3)	3.4E-05	$(ug/m^3)^{-1}$	5.7E-08	5.9E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.02
				Phenanthrene	1.2E-4	mg/m^3	2.3E-06	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	8.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	1.9E-11	(mg/m^3)	NA	$(ug/m^3)^{-1}$	- -	6.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								5.7E-08					0.02
		Exposure Point Total									5.7E-08					0.02
	Exposure Medium Total										5.7E-08					0.02
Medium Total											4.6E-05					0.05
										Total of Receptor Risks Across All Media	5.3E-05				Total of Receptor Hazards Across All Media	0.05

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Ingestion	Benzo(a)anthracene	0.89	mg/kg	6.4E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-08	4.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	5.7E-08	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	4.1E-07	3.6E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	4.3E-08	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-09	2.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	9.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.8E-08	6.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	2.7E-08	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	1.9E-08	1.7E-07	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								5.5E-07					--
			Dermal	Benzo(a)anthracene	0.89	mg/kg	9.5E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	6.9E-09	6.0E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	0.79	mg/kg	8.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	6.2E-08	5.4E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	0	mg/kg	0.0E+00	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	- -	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(k)fluoranthene	0.6	mg/kg	6.4E-09	(mg/kg/day)	7.3E-02	$(mg/kg/day)^{-1}$	4.7E-10	4.1E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.13	mg/kg	1.4E-09	(mg/kg/day)	7.3E+00	$(mg/kg/day)^{-1}$	1.0E-08	8.8E-09	(mg/kg/day)	NA	(mg/kg/day)	--
				Indeno(1,2,3-cd)pyrene	0.37	mg/kg	3.9E-09	(mg/kg/day)	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-09	2.5E-08	(mg/kg/day)	NA	(mg/kg/day)	--
			Exp. Route Total								8.2E-08					--
		Exposure Point Total									6.3E-07					--
	Exposure Medium Total										6.3E-07					--
	Air	OU9	Inhalation	Benzo(a)anthracene	9.5E-11	mg/m^3	9.6E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	1.1E-12	6.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	8.4E-11	mg/m^3	8.5E-12	(mg/m^3)	1.1E-03	$(ug/m^3)^{-1}$	9.3E-12	5.4E-11	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	6.4E-11	mg/m^3	6.5E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	7.1E-13	4.1E-11	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	1.4E-11	mg/m^3	1.4E-12	(mg/m^3)	1.2E-03	$(ug/m^3)^{-1}$	1.7E-12	8.9E-12	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	3.9E-11	mg/m^3	4.0E-12	(mg/m^3)	1.1E-04	$(ug/m^3)^{-1}$	4.4E-13	2.5E-11	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								1.3E-11					--
		Exposure Point Total									1.3E-11					--
	Exposure Medium Total										1.3E-11					--
Medium Total											6.3E-07					--

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Subsurface Soil	OU9	Ingestion	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	4.0E-04	(mg/kg/day)	--
				Mercury	0.25	mg/kg	1.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.1E-07	(mg/kg/day)	3.0E-04	(mg/kg/day)	0.0004
				2-Methylnaphthalene	17	mg/kg	7.8E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	7.8E-06	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.002
				Acenaphthylene	3.3	mg/kg	1.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.5E-06	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.00003
				Benzo(a)anthracene	4.7	mg/kg	3.4E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	2.5E-07	2.2E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	3.6E-07	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	2.6E-06	2.3E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	3.0E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	2.2E-07	1.9E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00004
				Benzo(k)fluoranthene	1.7	mg/kg	1.2E-07	(mg/kg/day)	7.3E-02	(mg/kg/day)$^{-1}$	8.9E-09	7.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	3.3E-07	(mg/kg/day)	7.3E-03	(mg/kg/day)$^{-1}$	2.4E-09	2.1E-06	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	6.3E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	4.6E-07	4.0E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	2.9E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.9E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00007
				Fluorene	2.9	mg/kg	1.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	1.3E-06	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00003
				Indeno(1,2,3-cd)pyrene	2	mg/kg	1.4E-07	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.1E-07	9.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	2.3E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.3E-06	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.0001
				Phenanthrene	12	mg/kg	5.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	5.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
				Pyrene	9.9	mg/kg	4.5E-07	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.5E-06	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.0002
			Exp. Route Total								3.7E-06					0.003
			Dermal	Antimony	0	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	6.0E-05	(mg/kg/day)	--
				Mercury	0.25	mg/kg	0.0E+00	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	0.0E+00	(mg/kg/day)	2.1E-05	(mg/kg/day)	--
				2-Methylnaphthalene	17	mg/kg	8.9E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.9E-07	(mg/kg/day)	4.0E-03	(mg/kg/day)	0.0002
				Acenaphthylene	3.3	mg/kg	2.2E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.2E-07	(mg/kg/day)	6.0E-02	(mg/kg/day)	0.000004
				Benzo(a)anthracene	4.7	mg/kg	5.0E-08	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	3.7E-08	3.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(a)pyrene	5	mg/kg	5.3E-08	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	3.9E-07	3.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(b)fluoranthene	4.1	mg/kg	4.4E-08	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	3.2E-08	2.8E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Benzo(g,h,i)perylene	2.9	mg/kg	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.000007
				Benzo(k)fluoranthene	1.7	mg/kg	1.8E-08	(mg/kg/day)	7.3E-02	(mg/kg/day)$^{-1}$	1.3E-09	1.2E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Chrysene	4.6	mg/kg	4.9E-08	(mg/kg/day)	7.3E-03	(mg/kg/day)$^{-1}$	3.6E-10	3.1E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Dibenzo(a,h)anthracene	0.87	mg/kg	9.3E-09	(mg/kg/day)	7.3E+00	(mg/kg/day)$^{-1}$	6.8E-08	5.9E-08	(mg/kg/day)	NA	(mg/kg/day)	--
				Fluoranthene	6.4	mg/kg	4.3E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	4.3E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.00001
				Fluorene	2.9	mg/kg	2.0E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	2.0E-07	(mg/kg/day)	4.0E-02	(mg/kg/day)	0.000005
				Indeno(1,2,3-cd)pyrene	2	mg/kg	2.1E-08	(mg/kg/day)	7.3E-01	(mg/kg/day)$^{-1}$	1.6E-08	1.4E-07	(mg/kg/day)	NA	(mg/kg/day)	--
				Naphthalene	5	mg/kg	3.4E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	3.4E-07	(mg/kg/day)	2.0E-02	(mg/kg/day)	0.00002
				Phenanthrene	12	mg/kg	8.1E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	8.1E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00003
				Pyrene	9.9	mg/kg	6.7E-08	(mg/kg/day)	NA	(mg/kg/day)$^{-1}$	- -	6.7E-07	(mg/kg/day)	3.0E-02	(mg/kg/day)	0.00002
			Exp. Route Total								5.4E-07					0.0003
		Exposure Point Total									4.2E-06					0.003
Exposure Medium Total											4.2E-06					0.003

TABLE 7.6.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	
Subsurface Soil	Air	OU9	Inhalation	Antimony	0.0E+0	mg/m^3	0.0E+00	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	0.0E+00	(mg/m^3)	NA	(mg/m^3)	--
				Mercury	2.7E-11	mg/m^3	1.7E-12	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.7E-11	(mg/m^3)	NA	(mg/m^3)	--
				2-Methylnaphthalene	2.5E-04	mg/m^3	1.6E-05	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.6E-04	(mg/m^3)	NA	(mg/m^3)	--
				Acenaphthylene	2.3E-5	mg/m^3	1.5E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	1.5E-05	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)anthracene	5.0E-10	mg/m^3	5.1E-11	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	5.6E-12	3.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(a)pyrene	5.3E-10	mg/m^3	5.4E-11	(mg/m^3)	1.1E-03	(ug/m^3)$^{-1}$	5.9E-11	3.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(b)fluoranthene	4.4E-10	mg/m^3	4.4E-11	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	4.8E-12	2.8E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(g,h,i)perylene	3.1E-10	mg/m^3	2.0E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	2.0E-10	(mg/m^3)	NA	(mg/m^3)	--
				Benzo(k)fluoranthene	1.8E-10	mg/m^3	1.8E-11	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	2.0E-12	1.2E-10	(mg/m^3)	NA	(mg/m^3)	--
				Chrysene	4.9E-10	mg/m^3	4.9E-11	(mg/m^3)	1.1E-05	(ug/m^3)$^{-1}$	5.4E-13	3.1E-10	(mg/m^3)	NA	(mg/m^3)	--
				Dibenzo(a,h)anthracene	9.3E-11	mg/m^3	9.4E-12	(mg/m^3)	1.2E-03	(ug/m^3)$^{-1}$	1.1E-11	6.0E-11	(mg/m^3)	NA	(mg/m^3)	--
				Fluoranthene	6.8E-10	mg/m^3	4.4E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	4.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Fluorene	8.8E-6	mg/m^3	5.6E-07	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	5.6E-06	(mg/m^3)	NA	(mg/m^3)	--
				Indeno(1,2,3-cd)pyrene	2.1E-10	mg/m^3	2.2E-11	(mg/m^3)	1.1E-04	(ug/m^3)$^{-1}$	2.4E-12	1.4E-10	(mg/m^3)	NA	(mg/m^3)	--
				Naphthalene	9.2E-05	mg/m^3	5.9E-06	(mg/m^3)	3.4E-05	(ug/m^3)$^{-1}$	2.0E-07	5.9E-05	(mg/m^3)	3.0E-03	(mg/m^3)	0.02
				Phenanthrene	1.2E-4	mg/m^3	8.0E-06	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	8.0E-05	(mg/m^3)	NA	(mg/m^3)	--
				Pyrene	1.1E-9	mg/m^3	6.8E-11	(mg/m^3)	NA	(ug/m^3)$^{-1}$	- -	6.8E-10	(mg/m^3)	NA	(mg/m^3)	--
			Exp. Route Total								2.0E-07					0.02
		Exposure Point Total									2.0E-07					0.02
	Exposure Medium Total										2.0E-07					0.02
Medium Total											4.4E-06					0.02
										Total of Receptor Risks Across All Media	5.0E-06				Total of Receptor Hazards Across All Media	0.02

LIST OF TABLES
RAGS PART D TABLE 9
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

Table No.	
	REASONABLE MAXIMUM EXPOSURES
9.1.RME	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.RME	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.RME	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.RME	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.RME	Lifetime Recreational Users - Entire Site Surface/Subsurface Soil
9.6.RME	Child Residents - Entire Site Surface/Subsurface Soil
9.7.RME	Adult Residents - Entire Site Surface/Subsurface Soil
9.8.RME	Lifetime Residents - Entire Site Surface/Subsurface Soil
	CENTRAL TENDENCY EXPOSURES
9.1.CTE	Construction Workers - Entire Site Surface/Subsurface Soil
9.2.CTE	Occupational Workers - Entire Site Surface/Subsurface Soil
9.3.CTE	Child Recreational Users - Entire Site Surface/Subsurface Soil
9.4.CTE	Adult Recreational Users - Entire Site Surface/Subsurface Soil
9.5.CTE	Child Residents - Entire Site Surface/Subsurface Soil
9.6.CTE	Adult Residents - Entire Site Surface/Subsurface Soil

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	2E-08	--	7E-09	--	2E-08	NA	--	- -	--	--
			Benzo(a)pyrene	2E-07	--	6E-08	--	2E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	1E-09	--	5E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	7E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Chemical Total	2E-07	--	8E-08	--	3E-07		--	--	--	--
		Exposure Point Total						3E-07					--
	Exposure Medium Total							3E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-11	--	--	9E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Chemical Total	--	2E-09	--	--	2E-09		- -	--	- -	--
		Exposure Point Total						2E-09					--
	Exposure Medium Total							2E-09					--
Medium Total								3E-07					--

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	- -	--	0.002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.002	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00004	0.0001
			Benzo(a)anthracene	9E-08	--	4E-08	--	1E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	1E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	8E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.00007	0.0003
			Benzo(k)fluoranthene	3E-09	--	1E-09	--	5E-09	NA	--	- -	--	--
			Chrysene	9E-10	--	4E-10	--	1E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	7E-08	--	2E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0001	0.0004
			Fluorene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0005	- -	0.0002	0.0007
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0008	- -	0.0003	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0006	- -	0.0002	0.0009
			Chemical Total	1E-06	--	5E-07	--	2E-06		0.01	--	0.004	0.02
		Exposure Point Total						2E-06					0.02
Exposure Medium Total								2E-06					0.02

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-09	--	--	8E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Chrysene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-09	--	--	1E-09	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.02	- -	0.02
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	4E-08	--	--	4E-08		- -	0.02	- -	0.02
		Exposure Point Total						4E-08					0.02
	Exposure Medium Total							4E-08					0.02
Medium Total								2E-06					0.04
Receptor Total							Receptor Risk Total	2E-06				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.002
Total Blood HI	0.0003
Total Body Weight HI	0.0007
Total Kidney HI	0.002
Total Liver HI	0.0007
Total Lungs HI	0.01
Total Nasal HI	0.02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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	OU9	Benzo(a)anthracene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	2E-08	--	1E-08	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-07	--	3E-07	--	6E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	9E-08	--	8E-08	--	2E-07	NA	--	- -	--	--
			Chemical Total	3E-06	--	2E-06	--	5E-06		--	--	--	--
		Exposure Point Total						5E-06					--
	Exposure Medium Total							5E-06					--
	Air	OU9	Benzo(a)anthracene	--	9E-13	--	--	9E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	8E-12	--	--	8E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								5E-06					--

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0008	- -	--	0.0008
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.004	- -	0.003	0.007
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00005	- -	0.00005	0.00010
			Benzo(a)anthracene	1E-06	--	1E-06	--	2E-06	NA	--	- -	--	--
			Benzo(a)pyrene	1E-05	--	1E-05	--	2E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00009	- -	0.00008	0.0002
			Benzo(k)fluoranthene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Chrysene	1E-08	--	1E-08	--	2E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0002	- -	0.0001	0.0003
			Fluorene	- -	--	- -	--	- -	Blood	0.00007	- -	0.00006	0.0001
			Indeno(1,2,3-cd)pyrene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0002	- -	0.0002	0.0005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0004	- -	0.0003	0.0007
			Pyrene	- -	--	- -	--	- -	Kidney	0.0003	- -	0.0003	0.0006
			Chemical Total	2E-05	--	2E-05	--	3E-05		0.006	--	0.004	0.01
		Exposure Point Total						3E-05					0.01
Exposure Medium Total								3E-05					0.01

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	3E-07	--	--	3E-07	Nasal	- -	0.007	- -	0.007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.007	- -	0.007
		Exposure Point Total						3E-07					0.007
	Exposure Medium Total							3E-07					0.007
Medium Total								3E-05					0.02
Receptor Total							Receptor Risk Total	4E-05				Receptor HI Total	0.02

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0008
Total Blood HI	0.0002
Total Body Weight HI	0.0005
Total Kidney HI	0.001
Total Liver HI	0.0005
Total Lungs HI	0.007
Total Nasal HI	0.007

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	5E-07	--	4E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	4E-06	--	8E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	6E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	5E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Chemical Total	--	3E-12	--	--	3E-12		- -	--	- -	--
		Exposure Point Total						3E-12					--
	Exposure Medium Total							3E-12					--
Medium Total								1E-05					--

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.002	- -	--	0.002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.008	- -	0.004	0.01
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00007	0.0002
			Benzo(a)anthracene	3E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0002	- -	0.0001	0.0003
			Benzo(k)fluoranthene	1E-07	--	8E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	2E-08	--	5E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	4E-06	--	9E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0003	- -	0.0002	0.0005
			Fluorene	- -	--	- -	--	- -	Blood	0.0001	- -	0.00010	0.0002
			Indeno(1,2,3-cd)pyrene	1E-06	--	9E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0005	- -	0.0003	0.0008
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0007	- -	0.0005	0.001
			Pyrene	- -	--	- -	--	- -	Kidney	0.0006	- -	0.0004	0.001
			Chemical Total	4E-05	--	3E-05	--	7E-05		0.01	--	0.006	0.02
		Exposure Point Total						7E-05					0.02
Exposure Medium Total								7E-05					0.02

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chrysene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Naphthalene	--	1E-08	--	--	1E-08	Nasal	- -	0.001	- -	0.001
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-08	--	--	1E-08		- -	0.001	- -	0.001
		Exposure Point Total						1E-08					0.001
	Exposure Medium Total							1E-08					0.001
Medium Total								7E-05					0.02
Receptor Total							Receptor Risk Total	8E-05				Receptor HI Total	0.02

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.002
Total Blood HI	0.0004
Total Body Weight HI	0.0008
Total Kidney HI	0.002
Total Liver HI	0.0008
Total Lungs HI	0.01
Total Nasal HI	0.001

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	4E-08	--	4E-08	--	8E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	3E-09	--	6E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-08	--	6E-08	--	1E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	2E-08	--	4E-08	NA	--	- -	--	--
			Chemical Total	5E-07	--	5E-07	--	1E-06		--	--	--	--
		Exposure Point Total						1E-06					--
	Exposure Medium Total							1E-06					--
	Air	OU9	Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-14	--	--	6E-14	NA	- -	--	- -	--
			Chemical Total	--	2E-12	--	--	2E-12		- -	--	- -	--
		Exposure Point Total						2E-12					--
	Exposure Medium Total							2E-12					--
Medium Total								1E-06					--

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.00008	- -	--	0.00008
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0004	- -	0.0003	0.0008
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.000006	- -	0.000006	0.00001
			Benzo(a)anthracene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	2E-06	--	5E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	2E-07	--	4E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.000010	- -	0.00001	0.00002
			Benzo(k)fluoranthene	8E-09	--	8E-09	--	2E-08	NA	--	- -	--	--
			Chrysene	2E-09	--	2E-09	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-07	--	4E-07	--	8E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00002	- -	0.00002	0.00003
			Fluorene	- -	--	- -	--	- -	Blood	0.000007	- -	0.000008	0.00002
			Indeno(1,2,3-cd)pyrene	9E-08	--	1E-07	--	2E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.00003	- -	0.00003	0.00005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.00004	- -	0.00004	0.00008
			Pyrene	- -	--	- -	--	- -	Kidney	0.00003	- -	0.00003	0.00007
			Chemical Total	3E-06	--	3E-06	--	7E-06		0.0007	--	0.0005	0.001
		Exposure Point Total						7E-06					0.001
Exposure Medium Total								7E-06					0.001

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Chrysene	--	8E-14	--	--	8E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Naphthalene	--	3E-08	--	--	3E-08	Nasal	- -	0.0007	- -	0.0007
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-08	--	--	3E-08		- -	0.0007	- -	0.0007
		Exposure Point Total						3E-08					0.0007
	Exposure Medium Total							3E-08					0.0007
Medium Total								7E-06					0.002
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	0.002

Total Blood HI	0.00003
Total Body Weight HI	0.00005
Total Kidney HI	0.0002
Total Liver HI	0.00005
Total Lungs HI	0.0008
Total Nasal HI	0.0007

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	6E-07	--	4E-07	--	1E-06
			Benzo(a)pyrene	5E-06	--	4E-06	--	9E-06
			Benzo(b)fluoranthene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	4E-08	--	3E-08	--	7E-08
			Dibenzo(a,h)anthracene	9E-07	--	6E-07	--	1E-06
			Indeno(1,2,3-cd)pyrene	2E-07	--	2E-07	--	4E-07
			Chemical Total	7E-06	--	5E-06	--	1E-05
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
	Air	OU9	Benzo(a)anthracene	--	4E-13	--	--	4E-13
			Benzo(a)pyrene	--	3E-12	--	--	3E-12
			Benzo(b)fluoranthene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	3E-13	--	--	3E-13
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13
			Indeno(1,2,3-cd)pyrene	--	2E-13	--	--	2E-13
			Chemical Total	--	5E-12	--	--	5E-12
		Exposure Point Total						5E-12
	Exposure Medium Total							5E-12
Medium Total								1E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	3E-06	--	2E-06	--	5E-06
			Benzo(a)pyrene	3E-05	--	2E-05	--	6E-05
			Benzo(b)fluoranthene	3E-06	--	2E-06	--	5E-06
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	1E-07	--	8E-08	--	2E-07
			Chrysene	3E-08	--	2E-08	--	5E-08
			Dibenzo(a,h)anthracene	6E-06	--	4E-06	--	1E-05
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	1E-06	--	1E-06	--	2E-06
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	5E-05	--	3E-05	--	8E-05
		Exposure Point Total						8E-05
	Exposure Medium Total							8E-05

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	2E-12	--	--	2E-12
			Benzo(a)pyrene	--	2E-11	--	--	2E-11
			Benzo(b)fluoranthene	--	2E-12	--	--	2E-12
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	7E-13	--	--	7E-13
			Chrysene	--	2E-13	--	--	2E-13
			Dibenzo(a,h)anthracene	--	4E-12	--	--	4E-12
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	8E-13	--	--	8E-13
			Naphthalene	--	4E-08	--	--	4E-08
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	4E-08	--	--	4E-08
		Exposure Point Total						4E-08
	Exposure Medium Total							4E-08
Medium Total								8E-05
Receptor Total							Receptor Risk Total	9E-05

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	4E-06	--	1E-06	--	5E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-07	--	9E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	8E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-06	--	6E-07	--	2E-06	NA	--	- -	--	--
			Chemical Total	4E-05	--	2E-05	--	6E-05		--	--	--	--
		Exposure Point Total						6E-05					--
	Exposure Medium Total							6E-05					--
	Air	OU9	Benzo(a)anthracene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-11	--	--	4E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chemical Total	--	6E-11	--	--	6E-11		- -	--	- -	--
		Exposure Point Total						6E-11					--
	Exposure Medium Total							6E-11					--
Medium Total								6E-05					--

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.01	- -	--	0.01
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.05	- -	0.02	0.07
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0007	- -	0.0003	0.0010
			Benzo(a)anthracene	2E-05	--	7E-06	--	3E-05	NA	--	- -	--	--
			Benzo(a)pyrene	2E-04	--	8E-05	--	3E-04	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-05	--	6E-06	--	2E-05	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.001	- -	0.0004	0.002
			Benzo(k)fluoranthene	7E-07	--	3E-07	--	1E-06	NA	--	- -	--	--
			Chrysene	2E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-05	--	1E-05	--	5E-05	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.002	- -	0.0007	0.003
			Fluorene	- -	--	- -	--	- -	Blood	0.0009	- -	0.0003	0.001
			Indeno(1,2,3-cd)pyrene	9E-06	--	3E-06	--	1E-05	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.003	- -	0.001	0.004
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.005	- -	0.002	0.007
			Pyrene	- -	--	- -	--	- -	Kidney	0.004	- -	0.002	0.006
			Chemical Total	3E-04	--	1E-04	--	4E-04		0.08	--	0.02	0.1
		Exposure Point Total						4E-04					0.1
Exposure Medium Total								4E-04					0.1

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Chrysene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	3E-07	--	--	3E-07	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-07	--	--	3E-07		- -	0.03	- -	0.03
		Exposure Point Total						3E-07					0.03
	Exposure Medium Total							3E-07					0.03
Medium Total								4E-04					0.1
Receptor Total							Receptor Risk Total	5E-04				Receptor HI Total	0.1

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	0.002
Total Body Weight HI	0.004
Total Kidney HI	0.01
Total Liver HI	0.004
Total Lungs HI	0.07
Total Nasal HI	0.03

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	6E-07	--	3E-07	--	8E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	3E-06	--	8E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	4E-08	--	2E-08	--	6E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	4E-07	--	1E-06	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	1E-07	--	4E-07	NA	--	- -	--	--
			Chemical Total	7E-06	--	3E-06	--	1E-05		--	--	--	--
		Exposure Point Total						1E-05					--
	Exposure Medium Total							1E-05					--
	Air	OU9	Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-12	--	--	4E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Chemical Total	--	8E-11	--	--	8E-11		- -	--	- -	--
		Exposure Point Total						8E-11					--
	Exposure Medium Total							8E-11					--
Medium Total								1E-05					--

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.001	- -	--	0.001
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.006	- -	0.002	0.008
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00008	- -	0.00004	0.0001
			Benzo(a)anthracene	3E-06	--	2E-06	--	4E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	2E-05	--	5E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	3E-06	--	1E-06	--	4E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0001	- -	0.00007	0.0002
			Benzo(k)fluoranthene	1E-07	--	6E-08	--	2E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	1E-08	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	3E-06	--	8E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0002	- -	0.0001	0.0003
			Fluorene	- -	--	- -	--	- -	Blood	0.00010	- -	0.00005	0.0002
			Indeno(1,2,3-cd)pyrene	1E-06	--	7E-07	--	2E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0003	- -	0.0002	0.0005
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0005	- -	0.0003	0.0008
			Pyrene	- -	--	- -	--	- -	Kidney	0.0005	- -	0.0002	0.0007
			Chemical Total	4E-05	--	2E-05	--	7E-05		0.009	--	0.003	0.01
		Exposure Point Total						7E-05					0.01
Exposure Medium Total								7E-05					0.01

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Chrysene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Naphthalene	--	1E-06	--	--	1E-06	Nasal	- -	0.03	- -	0.03
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	1E-06	--	--	1E-06		- -	0.03	- -	0.03
		Exposure Point Total						1E-06					0.03
	Exposure Medium Total							1E-06					0.03
Medium Total								7E-05					0.04
Receptor Total							Receptor Risk Total	8E-05				Receptor HI Total	0.04

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.001
Total Blood HI	0.0003
Total Body Weight HI	0.0005
Total Kidney HI	0.002
Total Liver HI	0.0005
Total Lungs HI	0.008
Total Nasal HI	0.03

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Surface Soil	Surface Soil	OU9	Benzo(a)anthracene	4E-06	--	2E-06	--	6E-06
			Benzo(a)pyrene	4E-05	--	1E-05	--	5E-05
			Benzo(b)fluoranthene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	3E-07	--	1E-07	--	4E-07
			Dibenzo(a,h)anthracene	6E-06	--	2E-06	--	9E-06
			Indeno(1,2,3-cd)pyrene	2E-06	--	7E-07	--	3E-06
			Chemical Total	5E-05	--	2E-05	--	7E-05
		Exposure Point Total						7E-05
	Exposure Medium Total							7E-05
	Air	OU9	Benzo(a)anthracene	--	1E-11	--	--	1E-11
			Benzo(a)pyrene	--	1E-10	--	--	1E-10
			Benzo(b)fluoranthene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	7E-12	--	--	7E-12
			Dibenzo(a,h)anthracene	--	2E-11	--	--	2E-11
			Indeno(1,2,3-cd)pyrene	--	5E-12	--	--	5E-12
			Chemical Total	--	1E-10	--	--	1E-10
		Exposure Point Total						1E-10
	Exposure Medium Total							1E-10
Medium Total								7E-05

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -
			Mercury	- -	--	- -	--	- -
			2-Methylnaphthalene	- -	--	- -	--	- -
			Acenaphthylene	- -	--	- -	--	- -
			Benzo(a)anthracene	2E-05	--	9E-06	--	3E-05
			Benzo(a)pyrene	2E-04	--	9E-05	--	3E-04
			Benzo(b)fluoranthene	2E-05	--	8E-06	--	3E-05
			Benzo(g,h,i)perylene	- -	--	- -	--	- -
			Benzo(k)fluoranthene	8E-07	--	3E-07	--	1E-06
			Chrysene	2E-07	--	9E-08	--	3E-07
			Dibenzo(a,h)anthracene	4E-05	--	2E-05	--	6E-05
			Fluoranthene	- -	--	- -	--	- -
			Fluorene	- -	--	- -	--	- -
			Indeno(1,2,3-cd)pyrene	1E-05	--	4E-06	--	1E-05
			Naphthalene	- -	--	- -	--	- -
			Phenanthrene	- -	--	- -	--	- -
			Pyrene	- -	--	- -	--	- -
			Chemical Total	3E-04	--	1E-04	--	5E-04
		Exposure Point Total						5E-04
	Exposure Medium Total							5E-04

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -
			Mercury	--	- -	--	--	- -
			2-Methylnaphthalene	--	- -	--	--	- -
			Acenaphthylene	--	- -	--	--	- -
			Benzo(a)anthracene	--	6E-11	--	--	6E-11
			Benzo(a)pyrene	--	6E-10	--	--	6E-10
			Benzo(b)fluoranthene	--	5E-11	--	--	5E-11
			Benzo(g,h,i)perylene	--	- -	--	--	- -
			Benzo(k)fluoranthene	--	2E-11	--	--	2E-11
			Chrysene	--	6E-12	--	--	6E-12
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10
			Fluoranthene	--	- -	--	--	- -
			Fluorene	--	- -	--	--	- -
			Indeno(1,2,3-cd)pyrene	--	2E-11	--	--	2E-11

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Subsurface Soil	Air	OU9	Naphthalene	--	1E-06	--	--	1E-06
			Phenanthrene	--	- -	--	--	- -
			Pyrene	--	- -	--	--	- -
			Chemical Total	--	1E-06	--	--	1E-06
		Exposure Point Total						1E-06
	Exposure Medium Total							1E-06
Medium Total								5E-04
Receptor Total							Receptor Risk Total	5E-04

TABLE 9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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	OU9	Benzo(a)anthracene	4E-09	--	1E-09	--	6E-09	NA	--	- -	--	--
			Benzo(a)pyrene	4E-08	--	1E-08	--	5E-08	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-10	--	8E-11	--	4E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-09	--	2E-09	--	8E-09	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-09	--	5E-10	--	2E-09	NA	--	- -	--	--
			Chemical Total	5E-08	--	1E-08	--	7E-08		--	--	--	--
		Exposure Point Total						7E-08					--
	Exposure Medium Total							7E-08					--
	Air	OU9	Benzo(a)anthracene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-10	--	--	6E-10	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-11	--	--	5E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Chemical Total	--	8E-10	--	--	8E-10		- -	--	- -	--
		Exposure Point Total						8E-10					--
	Exposure Medium Total							8E-10					--
Medium Total								7E-08					--

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0004	- -	--	0.0004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	- -	0.0004	0.002
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000007	0.00003
			Benzo(a)anthracene	2E-08	--	6E-09	--	3E-08	NA	--	- -	--	--
			Benzo(a)pyrene	3E-07	--	7E-08	--	3E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-08	--	5E-09	--	3E-08	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00005	--	0.00001	0.00006
			Benzo(k)fluoranthene	9E-10	--	2E-10	--	1E-09	NA	--	- -	--	--
			Chrysene	2E-10	--	6E-11	--	3E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	4E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00008	- -	0.00002	0.00010
			Fluorene	- -	--	- -	--	- -	Blood	0.00004	- -	0.000009	0.00004
			Indeno(1,2,3-cd)pyrene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0001	- -	0.00003	0.0002
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00005	0.0002
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00004	0.0002
			Chemical Total	4E-07	--	9E-08	--	4E-07		0.003	--	0.0006	0.004
		Exposure Point Total						4E-07					0.004
Exposure Medium Total								4E-07					0.004

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
PORTSMOUTH NAVAL SHIPYARD - OPERABLE UNIT 9, KITTERY, MAINE

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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	4E-10	--	--	4E-10	NA	- -	--	- -	--
			Benzo(a)pyrene	--	4E-09	--	--	4E-09	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-10	--	--	3E-10	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-10	--	--	1E-10	NA	- -	--	- -	--
			Chrysene	--	3E-11	--	--	3E-11	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	7E-10	--	--	7E-10	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-10	--	--	2E-10	NA	- -	--	- -	--
			Naphthalene	--	2E-08	--	--	2E-08	Nasal	- -	0.01	- -	0.01
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-08	--	--	2E-08		- -	0.01	- -	0.01
		Exposure Point Total						2E-08					0.01
	Exposure Medium Total							2E-08					0.01
Medium Total								5E-07					0.01
Receptor Total							Receptor Risk Total	5E-07				Receptor HI Total	0.01

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0004
Total Blood HI	0.00008
Total Body Weight HI	0.0002
Total Kidney HI	0.0004
Total Liver HI	0.0002
Total Lungs HI	0.002
Total Nasal HI	0.01

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0004	- -	--	0.0004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	--	0.0002	0.002
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00002	- -	0.000004	0.00003
			Benzo(a)anthracene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	2E-06	--	3E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00004	- -	0.000007	0.00005
			Benzo(k)fluoranthene	7E-09	--	1E-09	--	8E-09	NA	--	- -	--	--
			Chrysene	2E-09	--	3E-10	--	2E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	3E-07	--	6E-08	--	4E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00007	- -	0.00001	0.00008
			Fluorene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000005	0.00004
			Indeno(1,2,3-cd)pyrene	8E-08	--	1E-08	--	9E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0001	- -	0.00002	0.0001
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00003	0.0002
			Pyrene	- -	--	- -	--	- -	Kidney	0.0001	- -	0.00002	0.0002
			Chemical Total	3E-06	--	5E-07	--	3E-06		0.003	--	0.0003	0.003
		Exposure Point Total						3E-06					0.003
Exposure Medium Total								3E-06					0.003

TABLE 9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/Future
Receptor Population: Occupational 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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-11	--	--	2E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chrysene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Naphthalene	--	8E-08	--	--	8E-08	Nasal	- -	0.006	- -	0.006
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	8E-08	--	--	8E-08		- -	0.006	- -	0.006
		Exposure Point Total						8E-08					0.006
	Exposure Medium Total							8E-08					0.006
Medium Total								3E-06					0.009
Receptor Total							Receptor Risk Total	4E-06				Receptor HI Total	0.009

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0004
Total Blood HI	0.00006
Total Body Weight HI	0.0001
Total Kidney HI	0.0004
Total Liver HI	0.0001
Total Lungs HI	0.002
Total Nasal HI	0.006

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-07	--	4E-08	--	2E-07	NA	--	- -	--	--
			Benzo(a)pyrene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	9E-09	--	3E-09	--	1E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-07	--	6E-08	--	3E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	6E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Chemical Total	2E-06	--	5E-07	--	2E-06		--	--	--	--
		Exposure Point Total						2E-06					--
	Exposure Medium Total							2E-06					--
	Air	OU9	Benzo(a)anthracene	--	5E-14	--	--	5E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	4E-14	--	--	4E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Chemical Total	--	7E-13	--	--	7E-13		- -	--	- -	--
		Exposure Point Total						7E-13					--
	Exposure Medium Total							7E-13					--
Medium Total								2E-06					--

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0004	- -	--	0.0004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	- -	0.0004	0.002
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000007	0.00003
			Benzo(a)anthracene	7E-07	--	2E-07	--	9E-07	NA	--	- -	--	--
			Benzo(a)pyrene	8E-06	--	2E-06	--	1E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	6E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00004	- -	0.00001	0.00006
			Benzo(k)fluoranthene	3E-08	--	8E-09	--	3E-08	NA	--	- -	--	--
			Chrysene	7E-09	--	2E-09	--	9E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-06	--	4E-07	--	2E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00007	- -	0.00002	0.00009
			Fluorene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000010	0.00004
			Indeno(1,2,3-cd)pyrene	3E-07	--	9E-08	--	4E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0001	- -	0.00003	0.0001
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00005	0.0002
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00004	0.0002
			Chemical Total	1E-05	--	3E-06	--	1E-05		0.003	--	0.0006	0.004
		Exposure Point Total						1E-05					0.004
Exposure Medium Total								1E-05					0.004

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Chrysene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	1E-13	--	--	1E-13	NA	- -	--	- -	--
			Naphthalene	--	3E-09	--	--	3E-09	Nasal	- -	0.0003	- -	0.0003
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	3E-09	--	--	3E-09		- -	0.0003	- -	0.0003
		Exposure Point Total						3E-09					0.0003
	Exposure Medium Total							3E-09					0.0003
Medium Total								1E-05					0.004
Receptor Total							Receptor Risk Total	2E-05				Receptor HI Total	0.004

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0004
Total Blood HI	0.00008
Total Body Weight HI	0.0001
Total Kidney HI	0.0004
Total Liver HI	0.0002
Total Lungs HI	0.002
Total Nasal HI	0.0003

TABLE 9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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	OU9	Benzo(a)anthracene	1E-08	--	3E-09	--	1E-08	NA	--	- -	--	--
			Benzo(a)pyrene	9E-08	--	3E-08	--	1E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	7E-10	--	2E-10	--	9E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	2E-08	--	4E-09	--	2E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	4E-09	--	1E-09	--	6E-09	NA	--	- -	--	--
			Chemical Total	1E-07	--	4E-08	--	2E-07		--	--	--	--
		Exposure Point Total						2E-07					--
	Exposure Medium Total							2E-07					--
	Air	OU9	Benzo(a)anthracene	--	4E-14	--	--	4E-14	NA	- -	--	- -	--
			Benzo(a)pyrene	--	3E-13	--	--	3E-13	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	3E-14	--	--	3E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	6E-14	--	--	6E-14	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Chemical Total	--	5E-13	--	--	5E-13		- -	--	- -	--
		Exposure Point Total						5E-13					--
	Exposure Medium Total							5E-13					--
Medium Total								2E-07					--

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.00002	- -	--	0.00002
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.0001	- -	0.00002	0.0001
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.000001	- -	0.0000004	0.000002
			Benzo(a)anthracene	5E-08	--	2E-08	--	7E-08	NA	--	- -	--	--
			Benzo(a)pyrene	6E-07	--	2E-07	--	8E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	5E-08	--	1E-08	--	6E-08	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.000002	- -	0.0000007	0.000003
			Benzo(k)fluoranthene	2E-09	--	6E-10	--	3E-09	NA	--	- -	--	--
			Chrysene	5E-10	--	2E-10	--	7E-10	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	1E-07	--	3E-08	--	1E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.000004	- -	0.000001	0.000005
			Fluorene	- -	--	- -	--	- -	Blood	0.000002	- -	0.0000005	0.000002
			Indeno(1,2,3-cd)pyrene	2E-08	--	7E-09	--	3E-08	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.000006	- -	0.000002	0.000008
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.00001	- -	0.000003	0.00001
			Pyrene	- -	--	- -	--	- -	Kidney	0.000008	- -	0.000002	0.00001
			Chemical Total	8E-07	--	2E-07	--	1E-06		0.0002	--	0.00003	0.0002
		Exposure Point Total						1E-06					0.0002
Exposure Medium Total								1E-06					0.0002

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Current/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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(a)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	2E-13	--	--	2E-13	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-14	--	--	7E-14	NA	- -	--	- -	--
			Chrysene	--	2E-14	--	--	2E-14	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	9E-14	--	--	9E-14	NA	- -	--	- -	--
			Naphthalene	--	6E-09	--	--	6E-09	Nasal	- -	0.0002	- -	0.0002
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	6E-09	--	--	6E-09		- -	0.0002	- -	0.0002
		Exposure Point Total						6E-09					0.0002
	Exposure Medium Total							6E-09					0.0002
Medium Total								1E-06					0.0004
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	--

Total Blood HI	0.000004
Total Body Weight HI	0.000008
Total Kidney HI	0.00002
Total Liver HI	0.000008
Total Lungs HI	0.0001
Total Nasal HI	0.0002

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	5E-07	--	8E-08	--	6E-07	NA	--	- -	--	--
			Benzo(a)pyrene	5E-06	--	7E-07	--	5E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-08	--	5E-09	--	4E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	8E-07	--	1E-07	--	9E-07	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Chemical Total	6E-06	--	9E-07	--	7E-06		--	--	--	--
		Exposure Point Total						7E-06					--
	Exposure Medium Total							7E-06					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	8E-13	--	--	8E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Chemical Total	--	2E-11	--	--	2E-11		- -	--	- -	--
		Exposure Point Total						2E-11					--
	Exposure Medium Total							2E-11					--
Medium Total								7E-06					--

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.004	- -	--	0.004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.02	- -	0.002	0.02
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.0002	- -	0.00003	0.0003
			Benzo(a)anthracene	3E-06	--	4E-07	--	3E-06	NA	--	- -	--	--
			Benzo(a)pyrene	3E-05	--	4E-06	--	3E-05	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-06	--	3E-07	--	3E-06	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.0004	- -	0.00006	0.0005
			Benzo(k)fluoranthene	1E-07	--	1E-08	--	1E-07	NA	--	- -	--	--
			Chrysene	3E-08	--	4E-09	--	3E-08	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-06	--	7E-07	--	6E-06	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.0007	- -	0.00010	0.0008
			Fluorene	- -	--	- -	--	- -	Blood	0.0003	- -	0.00005	0.0004
			Indeno(1,2,3-cd)pyrene	1E-06	--	2E-07	--	1E-06	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.001	- -	0.0002	0.001
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.002	- -	0.0002	0.002
			Pyrene	- -	--	- -	--	- -	Kidney	0.001	- -	0.0002	0.002
			Chemical Total	4E-05	--	6E-06	--	5E-05		0.03	--	0.003	0.03
		Exposure Point Total						5E-05					0.03
Exposure Medium Total								5E-05					0.03

TABLE 9.5.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	7E-12	--	--	7E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	7E-11	--	--	7E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	6E-13	--	--	6E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	3E-12	--	--	3E-12	NA	- -	--	- -	--
			Naphthalene	--	6E-08	--	--	6E-08	Nasal	- -	0.02	- -	0.02
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	6E-08	--	--	6E-08		- -	0.02	- -	0.02
		Exposure Point Total						6E-08					0.02
	Exposure Medium Total							6E-08					0.02
Medium Total								5E-05					0.05
Receptor Total							Receptor Risk Total	5E-05				Receptor HI Total	0.05

Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	--
Total Blood HI	0.0006
Total Body Weight HI	0.001
Total Kidney HI	0.004
Total Liver HI	0.001
Total Lungs HI	0.02
Total Nasal HI	0.02

TABLE 9.6.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURES

OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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	OU9	Benzo(a)anthracene	5E-08	--	7E-09	--	5E-08	NA	--	- -	--	--
			Benzo(a)pyrene	4E-07	--	6E-08	--	5E-07	NA	--	- -	--	--
			Benzo(b)fluoranthene	- -	--	- -	--	- -	NA	--	- -	--	--
			Benzo(k)fluoranthene	3E-09	--	5E-10	--	4E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	7E-08	--	1E-08	--	8E-08	NA	--	- -	--	--
			Indeno(1,2,3-cd)pyrene	2E-08	--	3E-09	--	2E-08	NA	--	- -	--	--
			Chemical Total	6E-07	--	8E-08	--	6E-07		--	--	--	--
		Exposure Point Total						6E-07					--
	Exposure Medium Total							6E-07					--
	Air	OU9	Benzo(a)anthracene	--	1E-12	--	--	1E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	9E-12	--	--	9E-12	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	7E-13	--	--	7E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	4E-13	--	--	4E-13	NA	- -	--	- -	--
			Chemical Total	--	1E-11	--	--	1E-11		- -	--	- -	--
		Exposure Point Total						1E-11					--
	Exposure Medium Total							1E-11					--
Medium Total								6E-07					--

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Subsurface Soil	OU9	Antimony	- -	--	- -	--	- -	Blood	--	- -	--	--
			Mercury	- -	--	- -	--	- -	Autoimmune	0.0004	- -	--	0.0004
			2-Methylnaphthalene	- -	--	- -	--	- -	Lungs	0.002	- -	0.0002	0.002
			Acenaphthylene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000004	0.00003
			Benzo(a)anthracene	2E-07	--	4E-08	--	3E-07	NA	--	- -	--	--
			Benzo(a)pyrene	3E-06	--	4E-07	--	3E-06	NA	--	- -	--	--
			Benzo(b)fluoranthene	2E-07	--	3E-08	--	2E-07	NA	--	- -	--	--
			Benzo(g,h,i)perylene	- -	--	- -	--	- -	Liver	0.00004	- -	0.000007	0.00005
			Benzo(k)fluoranthene	9E-09	--	1E-09	--	1E-08	NA	--	- -	--	--
			Chrysene	2E-09	--	4E-10	--	3E-09	NA	--	- -	--	--
			Dibenzo(a,h)anthracene	5E-07	--	7E-08	--	5E-07	NA	--	- -	--	--
			Fluoranthene	- -	--	- -	--	- -	Liver	0.00007	- -	0.00001	0.00008
			Fluorene	- -	--	- -	--	- -	Blood	0.00003	- -	0.000005	0.00004
			Indeno(1,2,3-cd)pyrene	1E-07	--	2E-08	--	1E-07	NA	--	- -	--	--
			Naphthalene	- -	--	- -	--	- -	Body Weight	0.0001	- -	0.00002	0.0001
			Phenanthrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00003	0.0002
			Pyrene	- -	--	- -	--	- -	Kidney	0.0002	- -	0.00002	0.0002
			Chemical Total	4E-06	--	5E-07	--	4E-06		0.003	--	0.0003	0.003
		Exposure Point Total						4E-06					0.003
Exposure Medium Total								4E-06					0.003

TABLE 9.6.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURES
OPERABLE UNIT 9, PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Scenario Timeframe: Future
Receptor Population: Residents
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
Subsurface Soil	Air	OU9	Antimony	--	- -	--	--	- -	NA	- -	--	- -	--
			Mercury	--	- -	--	--	- -	NA	- -	--	- -	--
			2-Methylnaphthalene	--	- -	--	--	- -	Nasal	- -	--	- -	--
			Acenaphthylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(a)anthracene	--	6E-12	--	--	6E-12	NA	- -	--	- -	--
			Benzo(a)pyrene	--	6E-11	--	--	6E-11	NA	- -	--	- -	--
			Benzo(b)fluoranthene	--	5E-12	--	--	5E-12	NA	- -	--	- -	--
			Benzo(g,h,i)perylene	--	- -	--	--	- -	NA	- -	--	- -	--
			Benzo(k)fluoranthene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Chrysene	--	5E-13	--	--	5E-13	NA	- -	--	- -	--
			Dibenzo(a,h)anthracene	--	1E-11	--	--	1E-11	NA	- -	--	- -	--
			Fluoranthene	--	- -	--	--	- -	NA	- -	--	- -	--
			Fluorene	--	- -	--	--	- -	NA	- -	--	- -	--
			Indeno(1,2,3-cd)pyrene	--	2E-12	--	--	2E-12	NA	- -	--	- -	--
			Naphthalene	--	2E-07	--	--	2E-07	Nasal	- -	0.02	- -	0.02
			Phenanthrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Pyrene	--	- -	--	--	- -	NA	- -	--	- -	--
			Chemical Total	--	2E-07	--	--	2E-07		- -	0.02	- -	0.02
		Exposure Point Total						2E-07					0.02
	Exposure Medium Total							2E-07					0.02
Medium Total								4E-06					0.02
Receptor Total							Receptor Risk Total	5E-06				Receptor HI Total	0.02

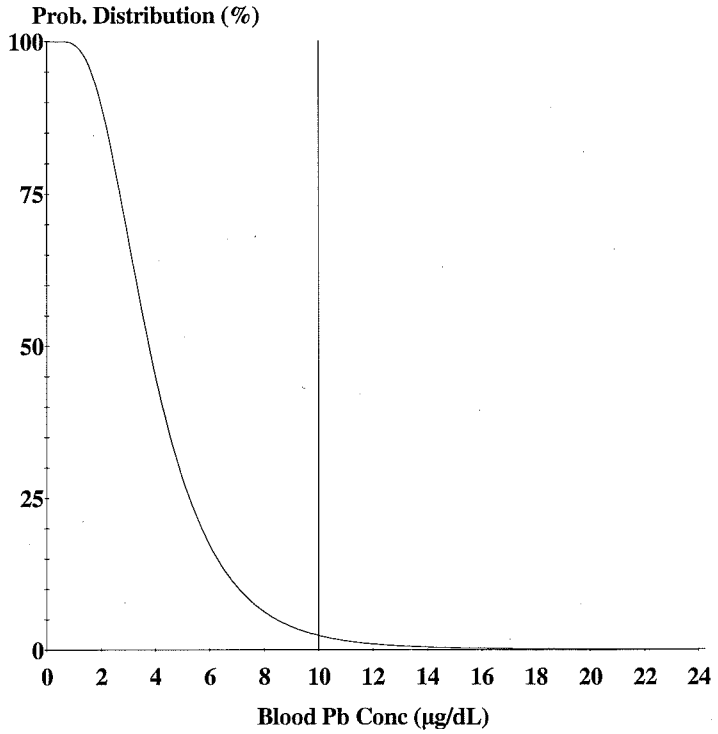
Notes:

1 - Mutagenic chemicals were evaluated in accordance with USEPA's Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (2005).

Total Autoimmune HI	0.0004
Total Blood HI	0.00007
Total Body Weight HI	0.0001
Total Kidney HI	0.0004
Total Liver HI	0.0001
Total Lungs HI	0.002
Total Nasal HI	0.02

I EUBK Output

Avg [Pb] for Entire Site



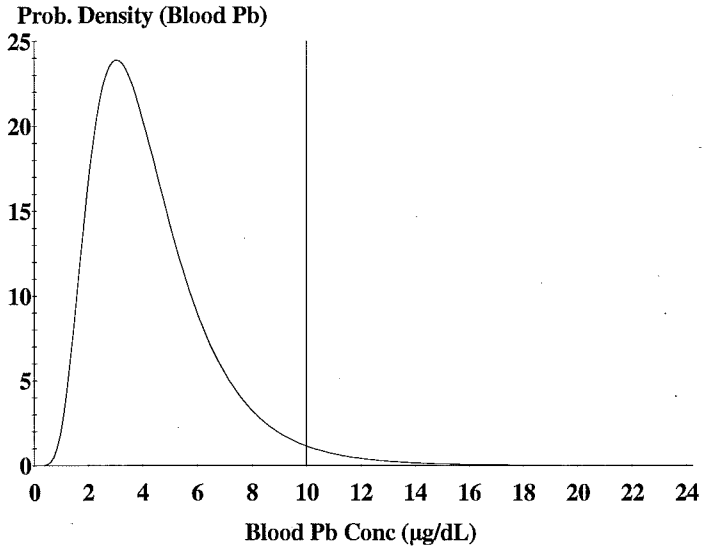
Cutoff = 10.000 µg/dl
Geo Mean = 3.960
GSD = 1.600
% Above = 2.437

Age Range = 0 to 84 months

Run Mode = Research

IEUBK Output

Avg [Pb] for Entire Site



Cutoff = 10.000 µg/dl
Geo Mean = 3.960
GSD = 1.600
% Above = 2.437
% Below = 97.563

Age Range = 0 to 84 months

Run Mode = Research

LEAD MODEL FOR WINDOWS Version 1.1

==========

Model Version: 1.1 Build9
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

I EUBK Output

==========

Average [Pb] for Entire Site

****** 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: 248.000 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	340.000	248.000
1-2	340.000	248.000
2-3	340.000	248.000
3-4	340.000	248.000
4-5	340.000	248.000
5-6	340.000	248.000
6-7	340.000	248.000

****** 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

IEUBK output

Avg [Pb] for Entire Site

****** 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	1.030	0.000	0.364
1-2	0.034	0.879	0.000	0.897
2-3	0.062	0.969	0.000	0.946
3-4	0.067	0.940	0.000	0.977
4-5	0.067	0.922	0.000	1.040
5-6	0.093	0.979	0.000	1.107
6-7	0.093	1.065	0.000	1.132

Year	Soil+Dust (µg/day)	Total (µg/day)	Blood (µg/dL)
.5-1	6.724	8.139	4.4
1-2	10.513	12.323	5.1
2-3	10.665	12.643	4.7
3-4	10.805	12.789	4.5
4-5	8.210	10.239	3.7
5-6	7.459	9.639	3.1
6-7	7.081	9.371	2.7

VAPOR INSTRUSION ANALYSIS

STRUCTURE TABLE

CB #48–1
RIM. ELEV.=110.4'

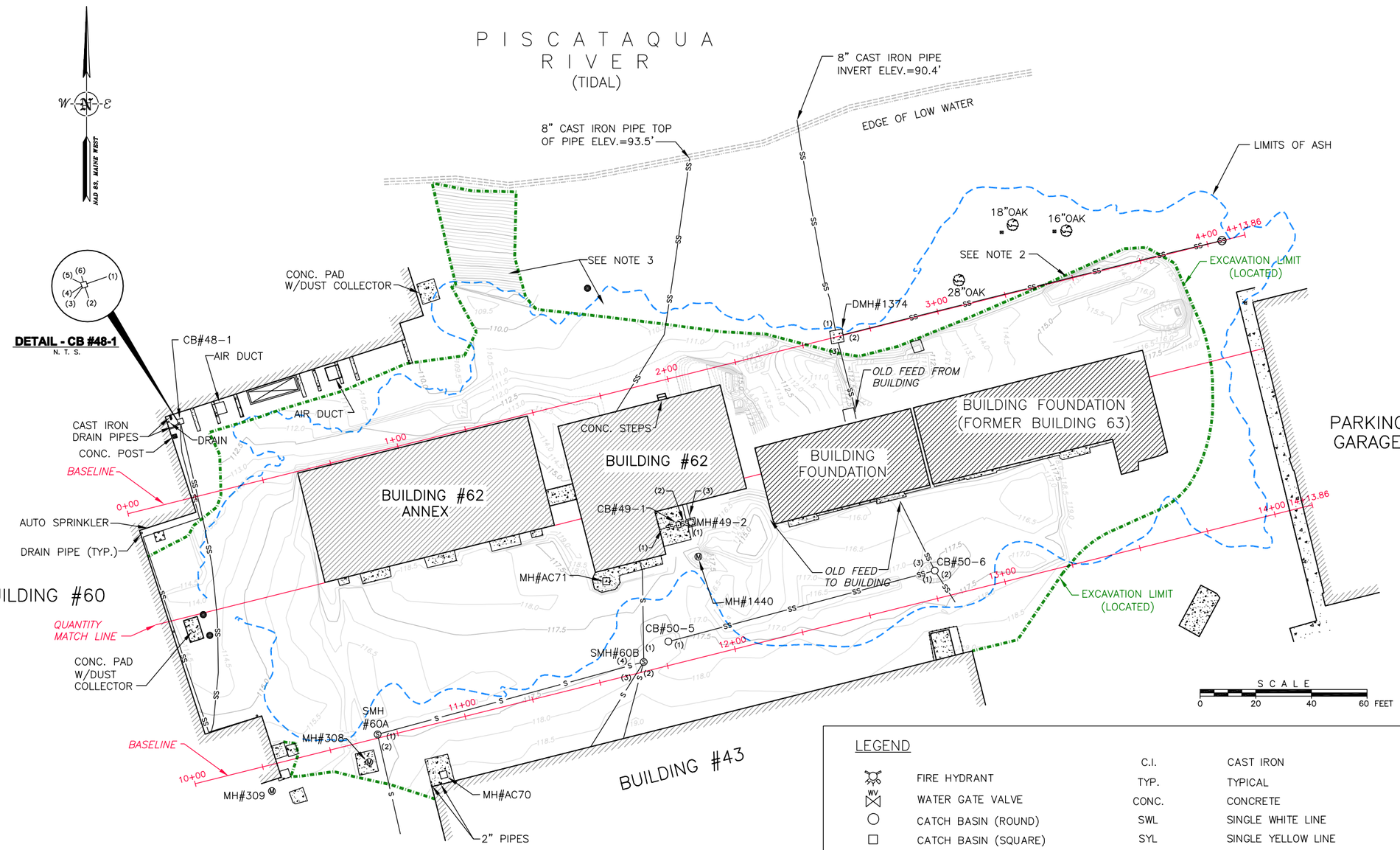
CB #49–1
RIM ELEV.=119.6'
(1) 4" C.I.=118.3'
(2) 6" C.I.=117.9'

MH #49–2
RIM ELEV.=119.5'
(1) 8" C.I.=115.6'
DESTINATION UNKNOWN
(2) 6" C.I.=116.0'
(3) 8" C.I.=115.6'

CB #50–5
RIM ELEV.=118.5'
(1) 8" C.I.=115.4'

CB #50–6
RIM. ELEV.=118.6'
(1) 8" C.I. ELEV.=114.0'
(2) 8" C.I. ELEV.=114.0'
(3) 12" C.I. ELEV.=114.0'

DMH #1374
RIM ELEV.=113.5'
(1) 24" C.I.=107.1'
(2) 18" R.C.P.=107.8'
(3) 12" C.I.=110.4'



DETAIL - CB #48-1
N. T. S.

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THE LIMIT OF EXCAVATION DOES NOT EXTEND TO THE LIMIT OF ASH IN ORDER TO PROTECT THE TREES.
3. AREA WAS EXCAVATED AS A PART OF SHORELINE STABILIZATION.
4. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS, TOPOGRAPHIC SURVEY , DATE: 12/12/07, SCALE: 1:20'
5. THE SURVEY ENTAILED THE SITE CONDITIONS DURING THREE DIFFERENT PHASES:

   PHASE 1 – "ORIGINAL EXISTING CONDITIONS" FIELDED ON 08/06/07 SHOWN ON PAGE 1 OF 7.

   PHASE 2 – "EXCAVATED SITE" FIELDED IN AUGUST, SEPTEMBER AND OCTOBERAS SHOWN ON PAGE 2 OF 7

   PHASE 3 – "AS–BUILT" FIELDED ON 11/09/07 AS SHOWN ON PAGE 3 OF 7
6. THE PLAN IS A COMPOSITE OF SURVEY DATA (TOPOGRAPHIC) PROVIDED BY NORTHEAST CIVIL SOLUTIONS AND SURVEY DATA PROVIDED BY THE CLIENT (UTILITIES AND THEIR CORRESPONDING UNDERGROUND LOCATIONS).

LEGEND

	FIRE HYDRANT	C.I.	CAST IRON
WV	WATER GATE VALVE	TYP.	TYPICAL
	CATCH BASIN (ROUND)	CONC.	CONCRETE
	CATCH BASIN (SQUARE)	SWL	SINGLE WHITE LINE
SS	DRAIN MANHOLE	SYL	SINGLE YELLOW LINE
E	ELECTRIC MANHOLE	111.0	EXCAVATION CONTOUR
S	SEWER MANHOLE		HANDRAIL
M	MANHOLE	S	SANITARY SEWER LINE
	BOLLARD	SS	STORM DRAIN LINE
	DECIDUOUS TREE	ST	STEAM LINE
	CONCRETE PAD	A	FORCED AIR LINE
	PAVED AREA	W	WATER LINE
	STORAGE CONTAINER	E	ELECTRIC LINE
R.C.P.	REINFORCED CONCRETE PIPE		APPROXIMATE LOW WATER LINE
			LIMIT OF EXCAVATION AS LOCATED
			LIMITS OF ASH

DATE	APPR	DESCRIPTION	STM

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS: SHW ENVIRONMENTAL 500 EAST MAIN STREET NORFOLK, VIRGINIA 23510
DSGN: J.H.K. DRWN: B.D.F CHK: P.S.V.
SUPV:
PRJMGR: F. POULIN CIV. STR.
MECH. ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN (SIGNED) P.M. (TITLE) 2/6/08 (DATE)

APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.–ARCH: /s/ SUPV. ENG.
SPV. ENG.–CIVIL: /s/ SUPV. ENG.
SPV. ENG.–ELEC: /s/ SUPV. ENG.
SPV. ENG.–MECH: /s/ SUPV. ENG.
CI – PW & E: /s/ CI – PW & E
APPROVED:
/s/ FEAD
FEAD PWD–ME DATE

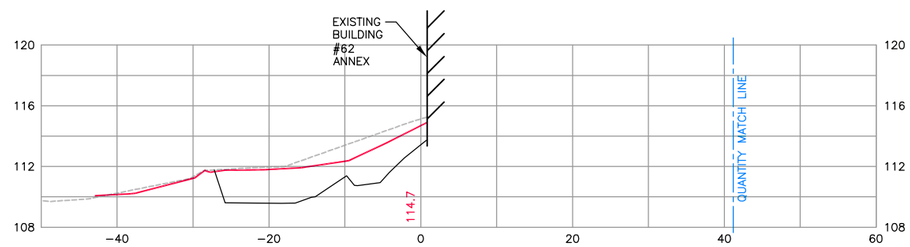
DEPARTMENT OF THE NAVY ~ NAVAL FACILITIES ENGINEERING COMMAND ~ NAVAL FACILITIES ENGINEERING COMMAND – NORFOLK, VIRGINIA
IPT NAVAL STATION – KITTERY, ME
PORTSMITH NAVAL SHIPYARD
SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION
EXCAVATION

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO–Number
SPEC. NO. 04–05–0050
CONSTR. CONTR. NO. N–62470–02–D–3260
NAVFAC DRAWING NO. 12513946
SHEET 3 OF 9
SHEET NO. C2
PW–ME DRAWING NO. RD–08–407

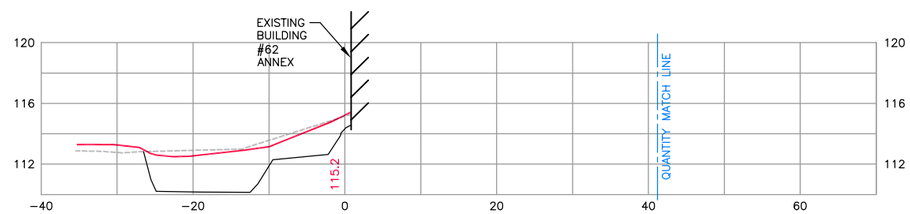
DRAWFORM REVISION: 11 APRIL 2007

FILE NAME: O:\Project\LANTDIV\Portsmouth\125490\125490\1.dwg LAYOUT NAME: C2 – Excavation PLOTTED: Wednesday, July 16, 2008 – 1:39pm

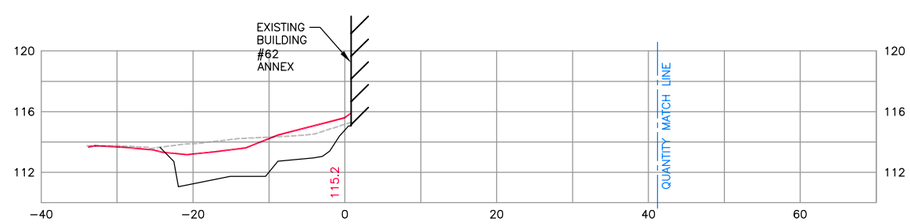
UNCLASSIFIED



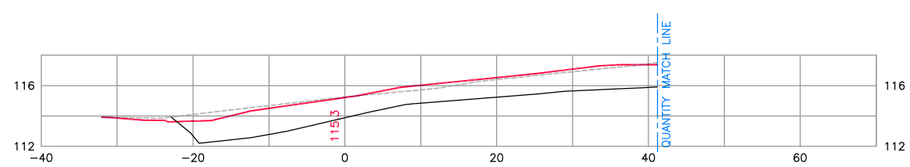
1+25



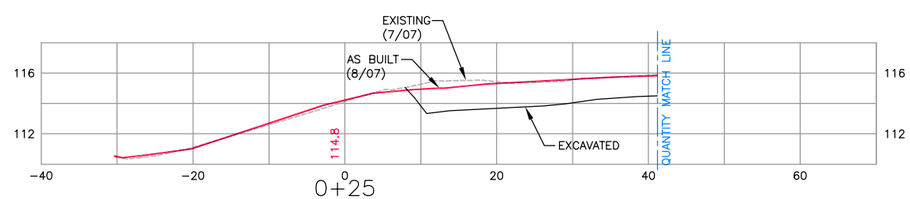
1+00



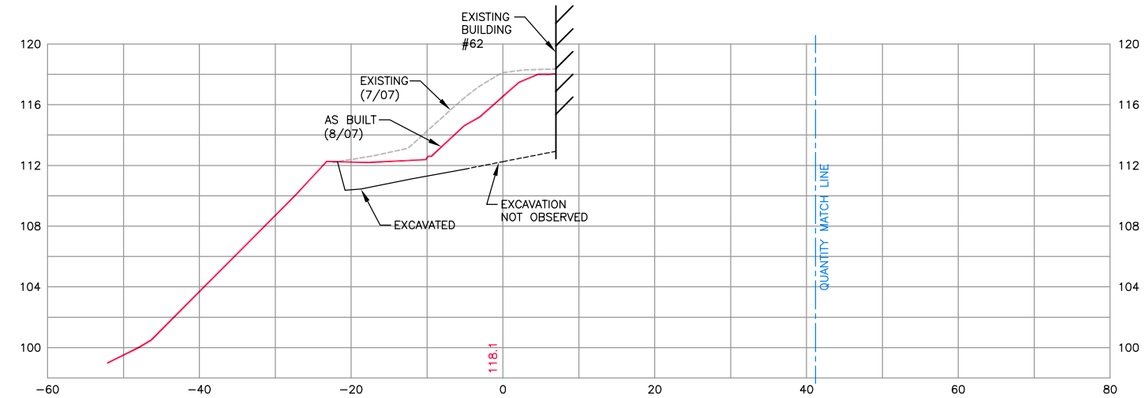
0+75



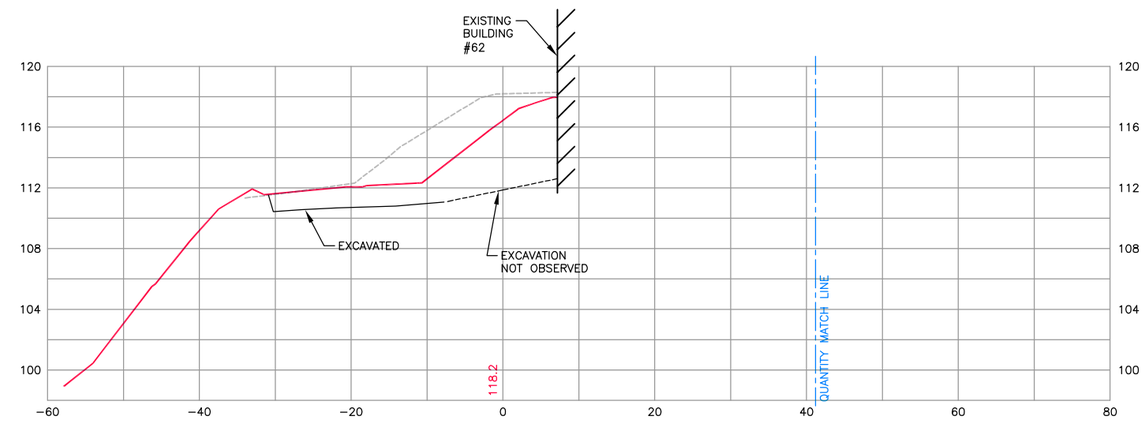
0+50



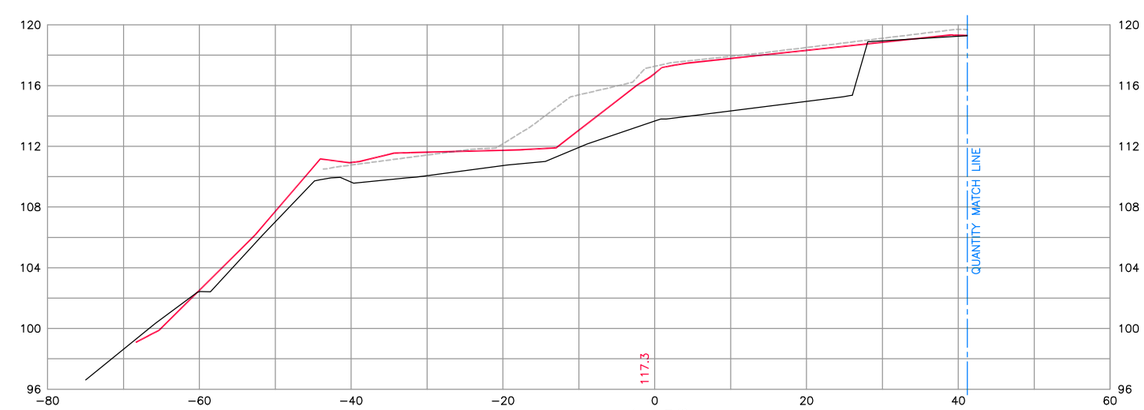
0+25



2+00



1+75



1+50

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS INC., TITLE: CROSS SECTIONS – STA. 0+25 TO STA. 2+00, DATE: 2/10/07.

HORIZONTAL SCALE
0 10 20 30 FEET

VERTICAL SCALE
0 5 10 15 FEET

SYM	DESCRIPTION	DATE	APPR

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:

A/E FIRM NAME AND ADDRESS:

DSGN: J.H.K. DRWN: B.O.F CHK: P.S.V.

SUPV:

PRJMGR. F. POULIN | CIV. STR.

MECH. | ARCH.

ELEC.

SUBMITTED BY:

FRED POULIN P.M. 2/6/08
(SIGNED) (TITLE) (DATE)

APPROVALS:

APPROVED:

/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)

PROJECT MANAGER: /s/PROJ. MANAGER

FIRE PROTECTION: /s/ FIRE PROTECTION

SPV. ENG.–ARCH: /s/ SUPV. ENG.

SPV. ENG.–CIVIL: /s/ SUPV. ENG.

SPV. ENG.–ELEC: /s/ SUPV. ENG.

SPV. ENG.–MECH: /s/ SUPV. ENG.

CI – PM & E: /s/ CI – PM & E

APPROVED:

/s/ FEAD
FEAD PWD–ME DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND ~
~ NAVAL FACILITIES ENGINEERING COMMAND ~
NAVAL STATION ~ NORFOLK, VIRGINIA

IPT

PORTSMITH NAVAL SHIPYARD
KITTERY, ME

SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION

CROSS SECTIONS - SHEET 1 OF 4

CODE ID. NO. 80091 | SIZE D

SCALE: AS SHOWN

MAXIMO No.: MAXIMO No.

JOB ORDER No.: JO–Number

SPEC. NO. 04–05–0050

CONSTR. CONTR. NO. N–62470–02–D–3260

NAVFAC DRAWING NO. 1251.3949

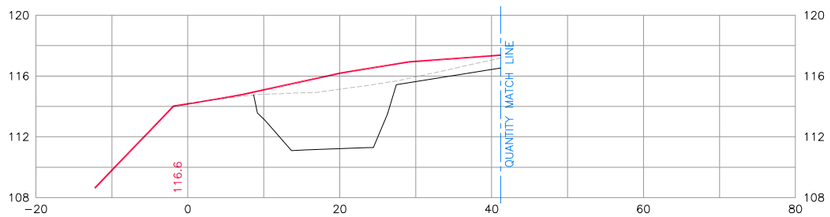
SHEET 6 OF 9

SHEET NO. C5 | PW–ME DRAWING NO. RD–08–410

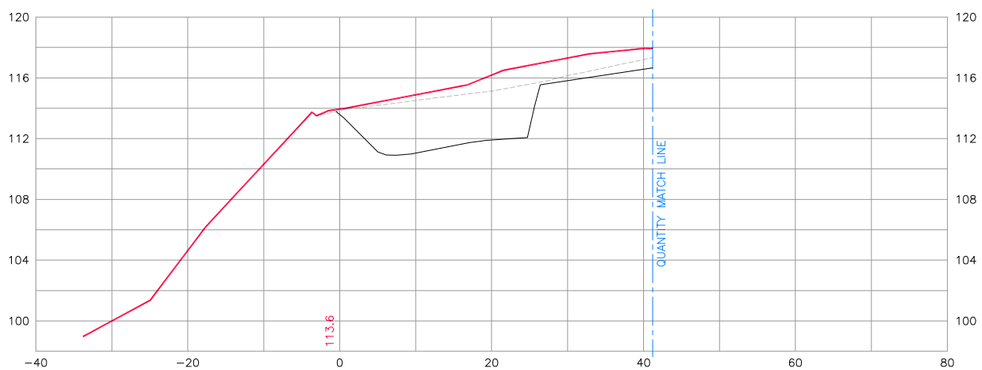
DRAWFORM REVISION: 11 APRIL 2007

FILE NAME: G:\Project\LANTDIV\Portsmouth\125490\125490C2.dwg LAYOUT NAME: C-5 PLOTTED: Wednesday, July 16, 2008 - 6:26am

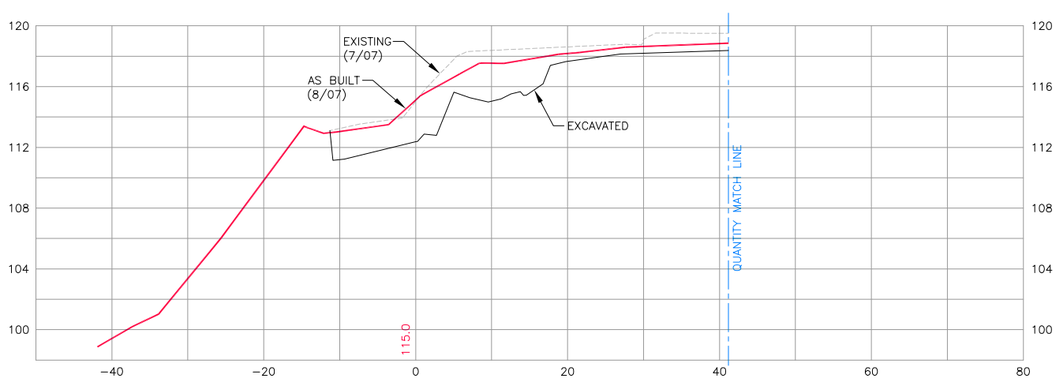
UNCLASSIFIED



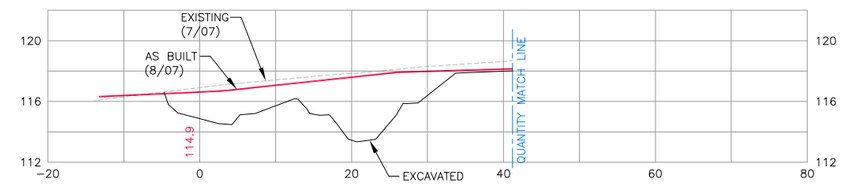
2+75



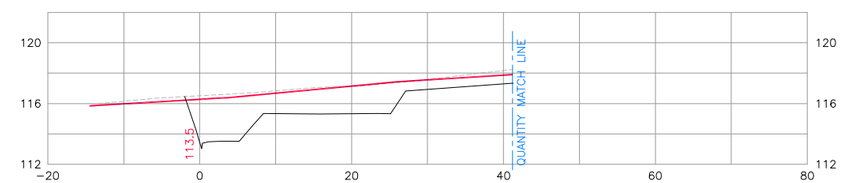
2+50



2+25

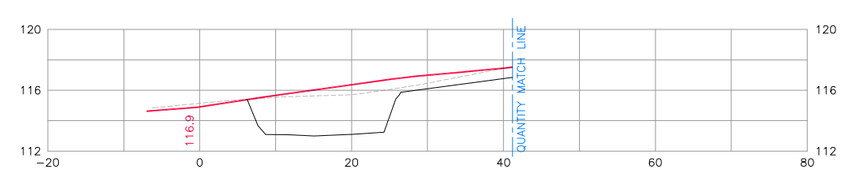


3+75



3+50

3+25



3+00

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS INC., TITLE: CROSS SECTIONS – STA. 0+25 TO STA. 2+00, DATE: 2/10/07.

HORIZONTAL SCALE
0 10 20 30 FEET

VERTICAL SCALE
0 5 10 15 FEET

SYM	DESCRIPTION	DATE	APPR.

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS:
DSGN: J.H.K. DRWN: B.O.F CHK: P.S.V.
SUPV:
PRJMGR: F. POULIN CIV. STR.
MECH. ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN P.M. 2/6/08
(SIGNED) (TITLE) (DATE)
APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.–ARCH: /s/ SUPV. ENG.
SPV. ENG.–CIVIL: /s/ SUPV. ENG.
SPV. ENG.–ELEC: /s/ SUPV. ENG.
SPV. ENG.–MECH: /s/ SUPV. ENG.
CI – PM & E: /s/ CI – PM & E
APPROVED:
/s/ FEAD
FEAD PWD–ME DATE

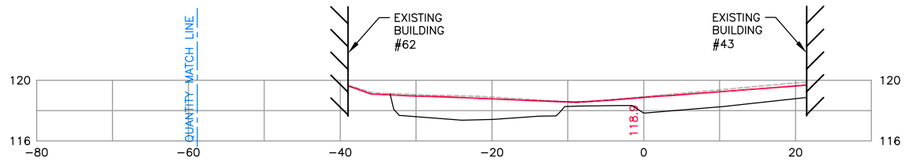
DEPARTMENT OF THE NAVY
~ NAVAL FACILITIES ENGINEERING COMMAND ~
NAVAL FACILITIES ENGINEERING COMMAND ~ NORFOLK, VIRGINIA
NAVAL STATION – KITTERY, ME
IPT
PORTSMITH NAVAL SHIPYARD
SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION
CROSS SECTIONS - SHEET 2 OF 4

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO–Number
SPEC. NO. 04–05–0050
CONSTR. CONTR. NO. N–62470–02–D–3260
NAVFAC DRAWING NO. 12513950
SHEET 7 OF 9
SHEET NO. C6 PW–ME DRAWING NO. RD–08–411

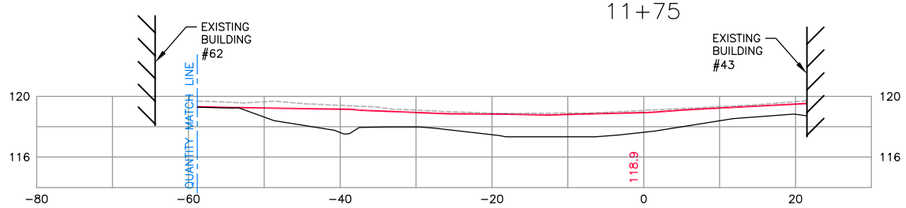
DRAWFORM REVISION: 11 APRIL 2007

UNCLASSIFIED

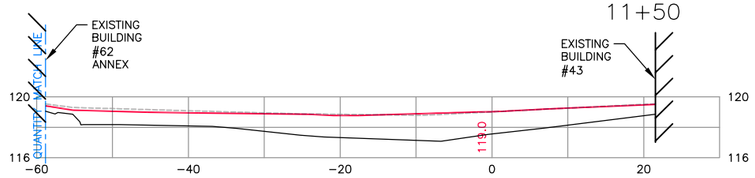
FILE NAME: G:\Project\LANTDIV\Portsmouth\125490\12549002.dwg LAYOUT NAME: C6 PLOTTED: Wednesday, July 16, 2008 – 2:18pm



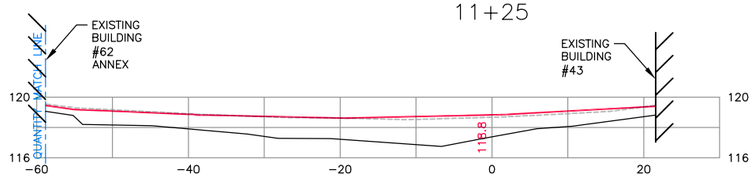
11+75



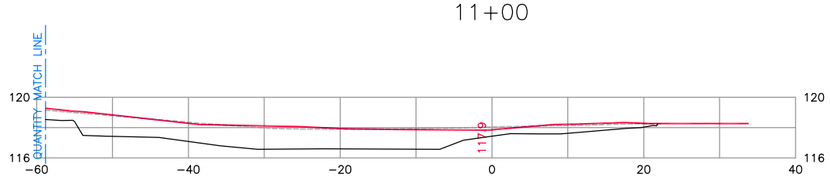
11+50



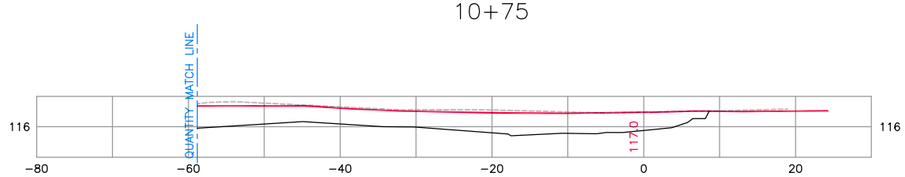
11+25



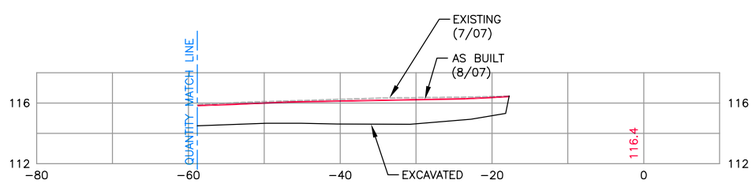
11+00



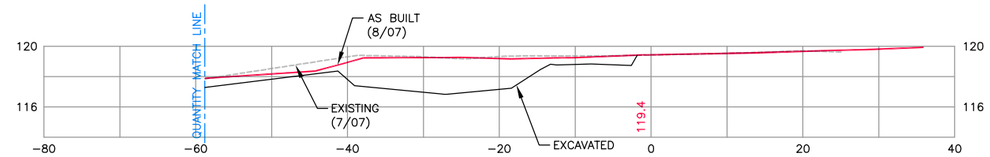
10+75



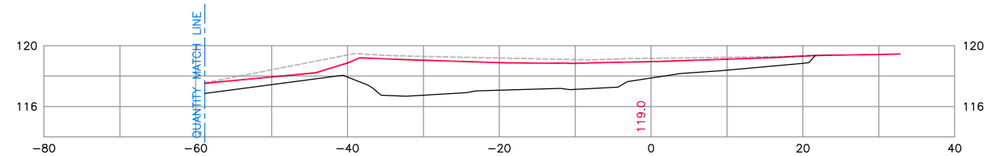
10+50



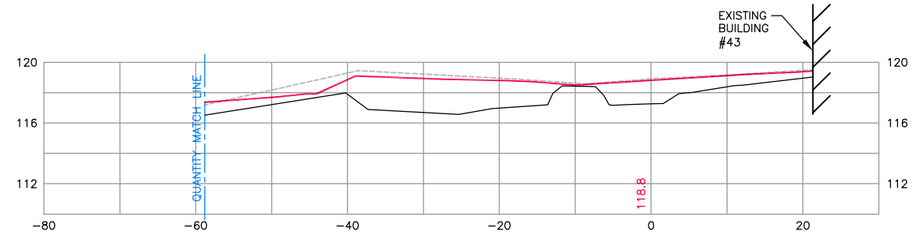
10+25



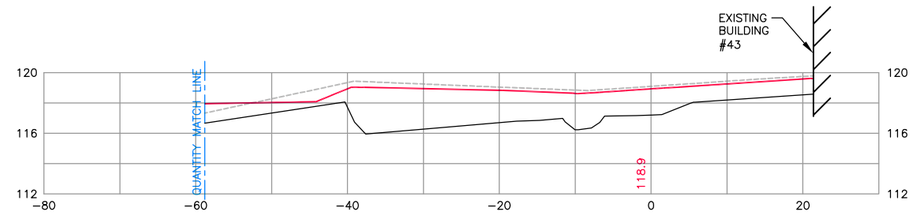
13+25



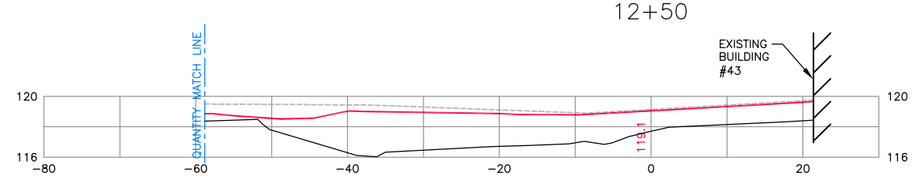
13+00



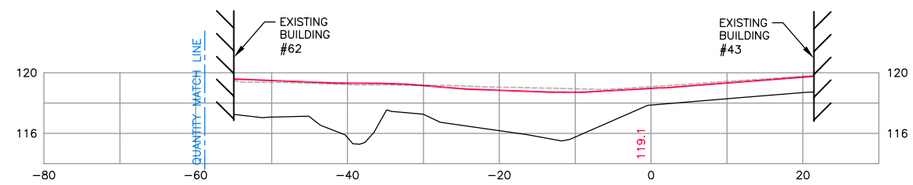
12+75



12+50



12+25



12+00

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS INC., TITLE: CROSS SECTIONS – STA. 0+25 TO STA. 2+00, DATE: 2/10/07.

HORIZONTAL SCALE
0 10 20 30 FEET

VERTICAL SCALE
0 5 10 15 FEET

SYM	DESCRIPTION	DATE	APPR

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS:
DSGN: J.H.K. DRWN: B.O.F CHK: P.S.V.
SUPV:
PRJMGR. F. POULIN CIV. STR.
MECH. ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN P.M. 2/6/08
(SIGNED) (TITLE) (DATE)

APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.–ARCH: /s/ SUPV. ENG.
SPV. ENG.–CIVIL: /s/ SUPV. ENG.
SPV. ENG.–ELEC: /s/ SUPV. ENG.
SPV. ENG.–MECH: /s/ SUPV. ENG.
CI – PM & E: /s/ CI – PM & E
APPROVED:
/s/ FEAD
FEAD PWD–ME DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
~ NAVAL FACILITIES ENGINEERING COMMAND ~
NAVAL STATION – NORFOLK, VIRGINIA
IPT
PORTSMITH NAVAL SHIPYARD
KITTERY, ME

SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION

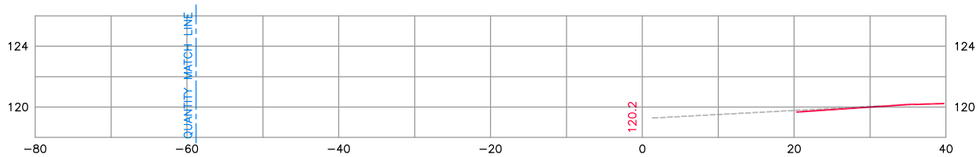
CROSS SECTIONS - SHEET 3 OF 4

CODE ID. NO. 80091 SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO–Number
SPEC. NO. 04–05–0050
CONSTR. CONTR. NO. N–62470–02–D–3260
NAVFAC DRAWING NO. 12513951
SHEET 8 OF 9
SHEET NO. C7 PW–ME DRAWING NO. RD–08–412

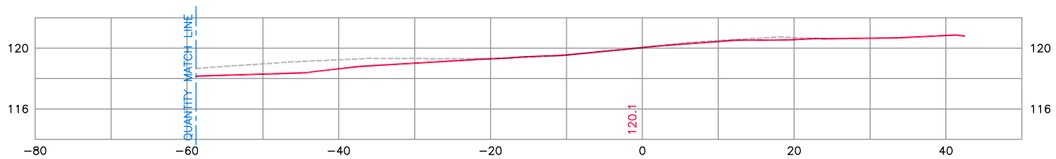
DRAWFORM REVISION: 11 APRIL 2007

FILE NAME: G:\Project\LANTDIV\Portsmouth\125490\125490C2.dwg LAYOUT NAME: C7 PLOTTED: Wednesday, July 16, 2008 – 6:27am

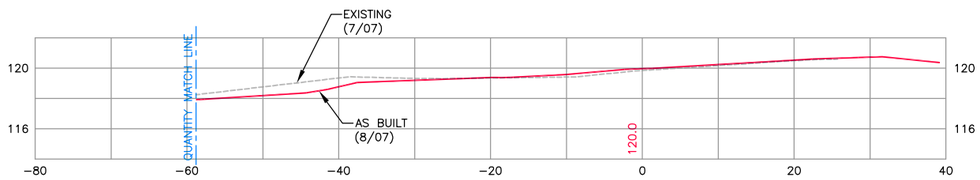
UNCLASSIFIED



14+00



13+75



13+50

REFERENCES:

1. ALL ELEVATIONS REFER TO PNS 2002 DATUM.
2. THIS DRAWING PREPARED USING DRAWING SUPPLIED BY NORTHEAST CIVIL SOLUTIONS INC., TITLE: CROSS SECTIONS – STA. 0+25 TO STA. 2+00, DATE: 2/10/07.

HORIZONTAL SCALE
0 10 20 30 FEET

VERTICAL SCALE
0 5 10 15 FEET

FILE NAME: O:\Project\LANTDIV\Portsmouth\125490\12549002.dwg LAYOUT NAME: C8 PLOTTED: Wednesday, July 16, 2008 - 6:26pm

SYM	DESCRIPTION	DATE	APPR

NAVFAC

Shaw Environmental, Inc.

SUBMITTED BY:
A/E FIRM NAME AND ADDRESS:
DSGN: J.H.K. DRWN: B.O.F CHK: P.S.V.
SUPV:
PRJMGR. F. POULIN | CIV. STR.
MECH. | ARCH.
ELEC.
SUBMITTED BY:
FRED POULIN P.M. 2/6/08
(SIGNED) (TITLE) (DATE)

APPROVALS:
APPROVED:
/s/ NAME, CODE, DATE
(CUSTOMER) (CODE) (DATE)
PROJECT MANAGER: /s/PROJ. MANAGER
FIRE PROTECTION: /s/ FIRE PROTECTION
SPV. ENG.-ARCH: /s/ SUPV. ENG.
SPV. ENG.-CIVIL: /s/ SUPV. ENG.
SPV. ENG.-ELEC: /s/ SUPV. ENG.
SPV. ENG.-MECH: /s/ SUPV. ENG.
CI – PM & E: /s/ CI – PM & E
APPROVED:
/s/ FEAD
FEAD PWD-ME DATE

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
~ NAVAL FACILITIES ENGINEERING COMMAND ~
NAVAL STATION – NORFOLK, VIRGINIA
IPT
PORTSMITH NAVAL SHIPYARD KITTERY, ME
SITE 34 SHORELINE STABILIZATION AND REMOVAL ACTION
CROSS SECTIONS - SHEET 4 OF 4

CODE ID. NO. 80091 | SIZE D
SCALE: AS SHOWN
MAXIMO No.: MAXIMO No.
JOB ORDER No.: JO-Number
SPEC. NO. 04-05-0050
CONSTR. CONTR. NO. N-62470-02-D-3260
NAVFAC DRAWING NO. 12513952
SHEET 9 OF 9
SHEET NO. C8 | PW-ME DRAWING NO. RD-08-413

DRAWFORM REVISION: 11 APRIL 2007

UNCLASSIFIED

Concentrations of Naphthalene in Surface Soil Samples Containing Ash/Burnt Material

OU9-SS-04-0002	NAPHTHALENE	5.8		UG/KG
34SS020002-AVG	NAPHTHALENE	40	U	UG/KG
34SS040001-AVG	NAPHTHALENE	27500	J	UG/KG
34SS050002	NAPHTHALENE	1200	J	UG/KG
34SS120002	NAPHTHALENE	2300		UG/KG
34SS130002	NAPHTHALENE	42	U	UG/KG

J = Estimated Result
U = Not Detected

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2		User Selected Options										
3			From File	Converted_Data.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	NAPHTHALENE											
10												
11						General Statistics						
12						Number of Valid Data	6			Number of Detected Data		4
13						Number of Distinct Detected Data	4			Number of Non-Detect Data		2
14										Percent Non-Detects		33.33%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	5.8			Minimum Detected		1.758
18						Maximum Detected	27500			Maximum Detected		10.22
19						Mean of Detected	7751			Mean of Detected		6.703
20						SD of Detected	13199			SD of Detected		3.562
21						Minimum Non-Detect	40			Minimum Non-Detect		3.689
22						Maximum Non-Detect	42			Maximum Non-Detect		3.738
23												
24				Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect		3
25				For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected		3
26				Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage		50.00%
27												
28						Warning: There are only 4 Distinct Detected Values in this data						
29						Note: It should be noted that even though bootstrap may be performed on this data set						
30						the resulting calculations may not be reliable enough to draw conclusions						
31												
32						It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.						
33												
34												
35						UCL Statistics						
36				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
37						Shapiro Wilk Test Statistic	0.696			Shapiro Wilk Test Statistic		0.922
38						5% Shapiro Wilk Critical Value	0.748			5% Shapiro Wilk Critical Value		0.748
39						Data not Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level		
40												
41						Assuming Normal Distribution				Assuming Lognormal Distribution		
42						DL/2 Substitution Method				DL/2 Substitution Method		
43						Mean	5174			Mean		5.475
44						SD	10976			SD		3.351
45						95% DL/2 (t) UCL	14204			95% H-Stat (DL/2) UCL		1.228E+13
46												
47						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
48						MLE yields a negative mean				Mean in Log Scale		5.115
49										SD in Log Scale		3.696
50										Mean in Original Scale		5170
51										SD in Original Scale		10978
52										95% t UCL		14201
53										95% Percentile Bootstrap UCL		13753

	A	B	C	D	E	F	G	H	I	J	K	L
54											95% BCA Bootstrap UCL	14518
55											95% H-UCL	1.74E+15
56												
57	**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**					
58					k star (bias corrected)	0.243	**Data appear Gamma Distributed at 5% Significance Level**					
59					Theta Star	31903						
60					nu star	1.944						
61												
62					A-D Test Statistic	0.254	**Nonparametric Statistics**					
63					5% A-D Critical Value	0.704					Kaplan-Meier (KM) Method	
64					K-S Test Statistic	0.704					Mean	5170
65					5% K-S Critical Value	0.418					SD	10022
66	**Data appear Gamma Distributed at 5% Significance Level**										SE of Mean	4724
67											95% KM (t) UCL	14689
68	**Assuming Gamma Distribution**										95% KM (z) UCL	12940
69				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	14021
70					Minimum	0.000001					95% KM (bootstrap t) UCL	90011
71					Maximum	27500					95% KM (BCA) UCL	14900
72					Mean	5168					95% KM (Percentile Bootstrap) UCL	14334
73					Median	602.9					95% KM (Chebyshev) UCL	25763
74					SD	10980					97.5% KM (Chebyshev) UCL	34673
75					k star	0.158					99% KM (Chebyshev) UCL	52177
76					Theta star	32664						
77					Nu star	1.898	**Potential UCLs to Use**					
78					AppChi2	0.139					95% KM (BCA) UCL	14900
79					95% Gamma Approximate UCL	70773						
80					95% Adjusted Gamma UCL	N/A						
81	**Note: DL/2 is not a recommended method.**											
82												
83	**Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.**											
84	**These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).**											
85	**For additional insight, the user may want to consult a statistician.**											
86												

SL-ADV
Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES [X]

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R (µg/kg)	Chemical
91203	1.49E+04	Naphthalene

MORE ↓

ENTER Average soil temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Depth below grade to bottom of contamination, (enter value of 0 if value is unknown) L_b (cm)	ENTER Totals must add up to value of L_t (cell G28) 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 A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
7.2	15.24	15.24	46	15.24	0	0	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 A soil organic carbon fraction, f_{oc}^A (unitless)	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 B soil organic carbon fraction, f_{oc}^B (unitless)	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)	ENTER Stratum C soil organic carbon fraction, f_{oc}^C (unitless)
Lookup Soil					Lookup Soil					Lookup Soil				
S	1.66	0.375	0.054	0.002	S	1.66	0.375	0.054	0.002					

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	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	2515	1140	300	0.1	1.5	5

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	25	250	1.0E-06	1
				Used to calculate risk-based soil concentration.	

END

CHEMICAL PROPERTIES 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)	Physical state at soil temperature, (S,L,G)
5.90E-02	7.50E-06	4.82E-04	25	10,373	491.14	748.40	2.00E+03	3.10E+01	3.4E-05	3.0E-03	S

END

INTERMEDIATE CALCULATIONS 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)	Floor-wall seam perimeter, X_{crack} (cm)	Initial soil concentration used, C_R (μg/kg)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)
7.88E+08	1	0.321	0.321	ERROR	0.015	1.62E-08	0.992	1.60E-08	7,310	1.49E+04	3.58E+05

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. soil temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. soil temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. soil 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)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)
2.98E+06	2.45E-04	15.24	12,941	1.20E-04	5.23E-03	1.75E-04	9.54E-03	0.00E+00	0.00E+00	9.54E-03	1	15.24

Soil-water partition coefficient, K_d (cm^3/g)	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., $C_{building}$ ($\mu g/m^3$)	Finite source β term (unitless)	Finite source ψ term $(sec)^{-1}$	Time for source depletion, τ_D (sec)	Exposure duration > time for source depletion (YES/NO)
4.00E+00	1.93E+04	0.10	8.33E+01	9.54E-03	7.31E+02	8.03E+51	NA	NA	3.42E+02	7.45E-06	1.47E+09	NO

Finite source indoor attenuation coefficient, $<\alpha>$ (unitless)	Mass limit bldg. conc., $C_{building}$ ($\mu g/m^3$)	Finite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Final finite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
2.26E-04	NA	4.37E+00	4.37E+00	3.4E-05	3.0E-03

END

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C_{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	1.25E+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)
3.6E-05	8.3E-01

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

APPENDIX D

ANALYTICAL RESULTS – OU9 DATABASE PRINTOUT

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-01		OU9-01		OU9-02		OU9-03		OU9-04		OU9-04	
LOCATION TYPE	SB		SB		SB		SB		SB		SB	
SAMPLE ID	OU9-SB-01-0204		OU9-SS-01-0002		OU9-SS-02-0002		OU9-SS-03-0002		OU9-SB-04-0205		OU9-SB-04-0508	
NORTHING	92060.4239		92060.4239		92056.4531		92061.6479		92066.3506		92066.3506	
EASTING	2799760.974		2799760.974		2799776.924		2799798.629		2799834.028		2799834.028	
SAMPLE DATE	08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009	
DEPTH INTERVAL (FT)	2 - 4		0 - 2		0 - 2		0 - 2		2 - 5		5 - 8	
METALS (MG/KG)												
ANTIMONY	0.22 J		0.6 J		0.55 J		0.77 J		1.1 J		0.8 J	
LEAD	35.6 J		441 J		97.9 J		457 J		121 J		171 J	
MERCURY	0.031		0.13		0.083		0.65		0.32		0.29	
PAHs (UG/KG)												
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	3.5 U		24		19		28		3.6 U		20 J	
ACENAPHTHYLENE	3.5 U		23		23		38		5.6		19 J	
ANTHRACENE	3.5 U		49		22		83		5.4		31 J	
BENZO(A)ANTHRACENE	3.1 J		140		52		250		26		67 J	
BENZO(A)PYRENE	2.4 J		130		57		210		23		58 J	
BENZO(B)FLUORANTHENE	3.8		180		60		270		27		61	
BENZO(G,H,I)PERYLENE	2.3 J		86		43		140		15		36	
BENZO(K)FLUORANTHENE	2.5 J		70		37		140		16		51 J	
CHRYSENE	3.5 J		150		51		200		25		67 J	
DIBENZO(A,H)ANTHRACENE	3.5 U		31		11		49		3.6 J		12 J	
FLUORANTHENE	6.1		330		100		530		52		140 J	
FLUORENE	3.5 U		25		17		38		2.5 J		20 J	
INDENO(1,2,3-CD)PYRENE	1.9 J		81		32		130		12		32 J	
NAPHTHALENE	3.5 U		4.1		12 J		18		3.4 J		11 J	
PHENANTHRENE	3.5		240		87		330		32		120 J	
PYRENE	4.8		250		97		430		44		120 J	

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-04		OU9-04		OU9-05		OU9-05		OU9-05		OU9-06	
LOCATION TYPE	SB		SB		SB		SB		SB		SB	
SAMPLE ID	OU9-SB-04-0508-D		OU9-SS-04-0002		OU9-SB-05-0205		OU9-SB-05-0507		OU9-SS-05-0002		OU9-SB-06-0205	
NORTHING	92066.3506		92066.3506		92030		92030		92030		92053.4194	
EASTING	2799834.028		2799834.028		2799782		2799782		2799782		2799856.843	
SAMPLE DATE	08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009	
DEPTH INTERVAL (FT)	5 - 8		0 - 2		2 - 5		5 - 7		0 - 2		2 - 5	
METALS (MG/KG)												
ANTIMONY	1.1 J		0.49 J		0.24 J		0.25 J		0.32 J		0.37 J	
LEAD	133 J		191 J		12.7 J		6.3 J		23.2 J		108 J	
MERCURY	0.4		0.19		0.11		0.19		0.027		0.0048 U	
PAHs (UG/KG)												
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	4.5 J		6.6		3.8 U		3.5 U		4.7		33	
ACENAPHTHYLENE	5.5 J		30		3.8 U		3.5 U		20		23	
ANTHRACENE	7.6 J		36		6.4		3.5 U		25		66	
BENZO(A)ANTHRACENE	34 J		130		5.6		3.5 U		82		250	
BENZO(A)PYRENE	31 J		150		4.5		3.5 U		72		230	
BENZO(B)FLUORANTHENE	37		190		6.3		3.5 U		76		270	
BENZO(G,H,I)PERYLENE	22		99		3.7 J		3.5 U		44		170	
BENZO(K)FLUORANTHENE	25 J		80		4.1		3.5 U		59		180	
CHRYSENE	38 J		160		6		3.5 U		77		220	
DIBENZO(A,H)ANTHRACENE	6.8 J		35		3.8 U		3.5 U		14		52	
FLUORANTHENE	69 J		260		13		3.1 J		160		550	
FLUORENE	3.7 J		11		3.8 U		3.5 U		8		37	
INDENO(1,2,3-CD)PYRENE	19 J		93		3.5 J		3.5 U		40		140	
NAPHTHALENE	2.7 J		5.8		3.8 U		3.5 U		2.7 J		17	
PHENANTHRENE	48 J		140		6.3		5.1		83		330	
PYRENE	58 J		220		10		2.9 J		130		440	

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-06		OU9-06		OU9-10		OU9-10		OU9-11		OU9-11	
LOCATION TYPE	SB		SB		SB		SB		SB		SB	
SAMPLE ID	OU9-SB-06-0508		OU9-SS-06-0002		OU9-SB-10-0608		OU9-SS-10-0002		OU9-SB-11-0206		OU9-SB-11-0206-D	
NORTHING	92053.4194		92053.4194		92018.156		92018.156		92015.18		92015.18	
EASTING	2799856.843		2799856.843		2799640.884		2799640.884		2799753.75		2799753.75	
SAMPLE DATE	08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009	
DEPTH INTERVAL (FT)	5 - 8		0 - 2		6 - 8		0 - 2		2 - 6		2 - 6	
METALS (MG/KG)												
ANTIMONY	0.36 J		0.41 J		0.6 J		0.57 J		2.1 J		1.7 J	
LEAD	51.2 J		60 J		31.2 J		29.9 J		167 J		165 J	
MERCURY	0.093		0.022		0.013		0.021		0.23		0.13	
PAHs (UG/KG)												
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	10		15		5.2		130		14 J		40 J	
ACENAPHTHYLENE	11		26		6		55		18 J		45 J	
ANTHRACENE	29		32		4.1		310		28 J		100 J	
BENZO(A)ANTHRACENE	95		94		6.6		450		69 J		260 J	
BENZO(A)PYRENE	82		92		23		350		62 J		220 J	
BENZO(B)FLUORANTHENE	97		110		15		350		73 J		250 J	
BENZO(G,H,I)PERYLENE	60		71		25		250		43 J		150 J	
BENZO(K)FLUORANTHENE	58		69		9.6		220		47 J		130 J	
CHRYSENE	82		84		12		340		64 J		210 J	
DIBENZO(A,H)ANTHRACENE	17		21		5.4		87		14 J		47 J	
FLUORANTHENE	210		200		6.7		990		170 J		550 J	
FLUORENE	15		17		4.9		160		18 J		46 J	
INDENO(1,2,3-CD)PYRENE	52		60		13		200		39 J		130 J	
NAPHTHALENE	5.4		7.8		3.9 U		54		11 J		23 J	
PHENANTHRENE	130		120		13		1100		130 J		460 J	
PYRENE	170		170		9.8		780		140 J		500 J	

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-11		OU9-12		OU9-12		OU9-12		OU9-12		OU9-12	
LOCATION TYPE	SB		SB		SB		SB		SB		SB	
SAMPLE ID	OU9-SS-11-0002		OU9-SB-12-0204		OU9-SB-12-0406		OU9-SB-12-0608		OU9-SS-12-0002		OU9-SS-12-0002-D	
NORTHING	92015.18		92005.95		92005.95		92005.95		92005.95		92005.95	
EASTING	2799753.75		2799721.98		2799721.98		2799721.98		2799721.98		2799721.98	
SAMPLE DATE	08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009		08/24/2009	
DEPTH INTERVAL (FT)	0 - 2		2 - 4		4 - 6		6 - 8		0 - 2		0 - 2	
METALS (MG/KG)												
ANTIMONY	0.15 UJ		1.1 U		0.72 U		0.55 U		0.6 J		1 U	
LEAD	20.5 J		1180		138		190		744 J		6650 J	
MERCURY	0.011		0.062		0.044		0.017		0.08		0.053	
PAHs (UG/KG)												
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	3.8 U		120		7.7		3.7 U		13		17	
ACENAPHTHYLENE	3.8 U		74 J		33 J		6 J		82		77 J	
ANTHRACENE	3.8 U		640		29		6.6		180		140	
BENZO(A)ANTHRACENE	3.8 U		800		84		14		400		280	
BENZO(A)PYRENE	3.8 U		500		89		13		270		220	
BENZO(B)FLUORANTHENE	3.8 U		590		97		13		340		230	
BENZO(G,H,I)PERYLENE	3.8 U		210		83		9.3		150		130	
BENZO(K)FLUORANTHENE	3.8 U		300		72		9.8		170		180	
CHRYSENE	3.8 U		680		90		14		290		240	
DIBENZO(A,H)ANTHRACENE	3.8 U		130		26		3.5 J		60		61	
FLUORANTHENE	3 J		1500		180		29		830		530	
FLUORENE	3.8 U		180		14		2.9 J		56		47	
INDENO(1,2,3-CD)PYRENE	3.8 U		220		65		7.8		140		120	
NAPHTHALENE	3.8 U		31		6.8		3.7 U		17		15	
PHENANTHRENE	3.8 U		1500		110		16		560 J		320 J	
PYRENE	2.2 J		1200		160		23		660		440	

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE
5 OF 10

LOCATION	OU9-13		OU9-13		OU9-14		OU9-14		OU9-14		OU9-15	
LOCATION TYPE	SB		SB		SB		SB		SB		SB	
SAMPLE ID	OU9-SB-13-0406		OU9-SB-13-0608		OU9-SB-14-0406		OU9-SB-14-0608		OU9-SB-14-0810		OU9-SB-15-0406	
NORTHING	92022.95		92022.95		92023.82		92023.82		92023.82		92021.92	
EASTING	2799654.33		2799654.33		2799660.06		2799660.06		2799660.06		2799648.29	
SAMPLE DATE	08/24/2009		08/24/2009		08/25/2009		08/25/2009		08/25/2009		08/25/2009	
DEPTH INTERVAL (FT)	4 - 6		6 - 8		4 - 6		6 - 8		8 - 10		4 - 6	
METALS (MG/KG)												
ANTIMONY	3.7		0.65 U		0.71 U		0.74 U		0.63 U		3	
LEAD	804		217		64.6		16.6		101		711	
MERCURY	3.5		0.85		0.55		0.046		0.22		7.4	
PAHs (UG/KG)												
2-METHYLNAPHTHALENE	--	--	--	--	--	--	--	--	--	--	--	--
ACENAPHTHENE	8400		21000		17		3.9 U		74		2200	
ACENAPHTHYLENE	7500 J		80000		210		14		4700 J		2600	
ANTHRACENE	27000		100000		160		9.6		1500		6000	
BENZO(A)ANTHRACENE	36000		170000		680		52		970		6700	
BENZO(A)PYRENE	36000		160000		830		57		4300		9200	
BENZO(B)FLUORANTHENE	32000		120000		650		50		2500		6900	
BENZO(G,H,I)PERYLENE	24000		100000		1000		61		8200		9200	
BENZO(K)FLUORANTHENE	19000		57000		260		25		1300		4500	
CHRYSENE	31000		150000		680		44		1300		6300	
DIBENZO(A,H)ANTHRACENE	7800		31000		330		18		1900		2800	
FLUORANTHENE	65000		190000		690		46		910		13000	
FLUORENE	13000		72000		75 J		5.6 J		990 J		3900 J	
INDENO(1,2,3-CD)PYRENE	18000		66000		540		34		4400		5500	
NAPHTHALENE	5200		54000		25		2.9 J		60		1400	
PHENANTHRENE	67000		320000		280		19		250		14000	
PYRENE	68000		380000 J		1200		83		1800		12000	

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-15		OU9-15		OU9-16	OU9-16	OU9-16	OU9-17
LOCATION TYPE	SB		SB		SB	SB	SB	SB
SAMPLE ID	OU9-SB-15-0608		OU9-SB-15-0810		OU9-SB-16-0205	OU9-SB-16-0508	OU9-SS-16-0002	OU9-SB-17-0205
NORTHING	92021.92		92021.92		91901.646	91901.646	91901.646	91931.837
EASTING	2799648.29		2799648.29		2799601.689	2799601.689	2799601.689	2799601.614
SAMPLE DATE	08/25/2009		08/25/2009		09/14/2010	09/14/2010	09/14/2010	09/14/2010
DEPTH INTERVAL (FT)	6 - 8		8 - 10		2 - 5	5 - 8	0 - 2	2 - 5
METALS (MG/KG)								
ANTIMONY	0.45 U		0.46 U		0.44 UJ	0.32 UJ	0.27 UJ	0.77 J
LEAD	172		38.6		5 J	2.4 J	22.1 J	13.4 J
MERCURY	1.2		0.35		0.005 J	0.021 U	0.73	0.026 U
PAHs (UG/KG)								
2-METHYLNAPHTHALENE	--	--	--	--	3.8 UJ	3.5 U	3.5 UJ	3.5 UJ
ACENAPHTHENE	500		360		3.8 U	3.5 U	3.5 U	3.5 U
ACENAPHTHYLENE	2400		840		3.8 U	3.5 U	4.4	3.5 U
ANTHRACENE	1200		690		3.8 U	3.5 U	6	3.5 U
BENZO(A)ANTHRACENE	2500		1000		3.8 U	3.5 U	21	3.5 U
BENZO(A)PYRENE	8600		2600		3.8 U	3.5 U	22	3.5 U
BENZO(B)FLUORANTHENE	5000		1700		3.8 UJ	3.5 U	22 J	3.5 UJ
BENZO(G,H,I)PERYLENE	10000		3000		3.8 UJ	3.5 U	14 J	5.4 J
BENZO(K)FLUORANTHENE	2100		600		3.8 U	3.5 U	18	3.5 U
CHRYSENE	3400		1100		3.8 U	3.5 U	24	3.5 U
DIBENZO(A,H)ANTHRACENE	2500		850		3.8 U	3.5 U	4.3	3.5 U
FLUORANTHENE	3300		1800		3.8 U	3.5 UJ	45	3.5 U
FLUORENE	1600 J		850 J		3.8 U	3.5 U	3.5 U	3.5 U
INDENO(1,2,3-CD)PYRENE	5500		1700		3.8 U	3.5 U	11	3.5 U
NAPHTHALENE	360		250		3.8 UJ	3.5 U	3.5 UJ	3.5 UJ
PHENANTHRENE	2800		1900		3.8 U	3.5 U	23	3.5 U
PYRENE	5100		1800		3.8 U	3.5 UJ	46	3.5 U

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-17	OU9-17	OU9-17	OU9-18	OU9-18	OU9-18	OU9-18
LOCATION TYPE	SB	SB	SB	SB	SB	SB	SB
SAMPLE ID	OU9-SB-17-0205-D	OU9-SB-17-0508	OU9-SS-17-0002	OU9-SB-18-0205	OU9-SB-18-0508	OU9-SB-18-0508-D	OU9-SS-18-0002
NORTHING	91931.837	91931.837	91931.837	91974.85	91974.85	91974.85	91974.85
EASTING	2799601.614	2799601.614	2799601.614	2799857.872	2799857.872	2799857.872	2799857.872
SAMPLE DATE	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010
DEPTH INTERVAL (FT)	2 - 5	5 - 8	0 - 2	2 - 5	5 - 8	5 - 8	0 - 2
METALS (MG/KG)							
ANTIMONY	0.62 J	0.87 J	0.43 UJ	0.32 UJ	0.31 UJ	0.30 UJ	2.1 J
LEAD	13.7 J	10.8 J	18.8 J	550 J	8.6 J	7.5 J	494 J
MERCURY	0.0033 J	0.025 U	0.049	0.40	0.021 J	0.042 J	1.1
PAHs (UG/KG)							
2-METHYLNAPHTHALENE	3.5 UJ	3.5 UJ	3.7 UJ	16 J	3.8 UJ	3.8 UJ	81 J
ACENAPHTHENE	3.5 U	3.5 U	3.7 U	45	3.8 U	3.8 U	530
ACENAPHTHYLENE	3.5 U	3.5 U	3.7 U	34	3.8 U	3.8 U	390
ANTHRACENE	3.5 U	3.5 U	3.7 U	91	3.8 U	3.8 U	1500
BENZO(A)ANTHRACENE	3.5 U	3.5 U	10	170	3.8 U	3.8 U	2700 J
BENZO(A)PYRENE	3.5 U	3.5 U	11	140	3.8 U	3.8 U	2400
BENZO(B)FLUORANTHENE	3.5 UJ	3.5 UJ	9.5 J	120 J	3.8 UJ	3.8 UJ	2800
BENZO(G,H,I)PERYLENE	3.5 UJ	3.5 UJ	11 J	83 J	3.8 UJ	3.8 UJ	1400
BENZO(K)FLUORANTHENE	3.5 U	3.5 U	6.7	150	3.8 U	3.8 U	2000
CHRYSENE	3.5 U	3.5 U	12	160	3.8 U	3.8 U	2900
DIBENZO(A,H)ANTHRACENE	3.5 U	3.5 U	3.7 U	28	3.8 U	3.8 U	290
FLUORANTHENE	3.5 U	3.5 U	13	240	3.8 U	3.8 U	4700
FLUORENE	3.5 U	3.5 U	3.7 U	43	3.8 U	3.8 U	690
INDENO(1,2,3-CD)PYRENE	3.5 U	3.5 U	7.1	71	3.8 U	3.8 U	1200
NAPHTHALENE	3.5 UJ	3.5 UJ	3.7 UJ	35 J	3.8 UJ	3.8 UJ	96 J
PHENANTHRENE	3.5 U	3.5 U	11	290	3.8 U	3.8 U	5100
PYRENE	3.5 U	3.5 U	17	230	3.8 U	3.8 U	4000 J

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-19	OU9-19	OU9-19	OU9-20	OU9-20	OU9-20
LOCATION TYPE	SB	SB	SB	SB	SB	SB
SAMPLE ID	OU9-SB-19-0205	OU9-SB-19-0508	OU9-SS-19-0002	OU9-SB-20-0205	OU9-SB-20-0508	OU9-SS-20-0002
NORTHING	92013.098	92013.098	92013.098	91994.698	91994.698	91994.698
EASTING	2799802.587	2799802.587	2799802.587	2799698.04	2799698.04	2799698.04
SAMPLE DATE	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010
DEPTH INTERVAL (FT)	2 - 5	5 - 8	0 - 2	2 - 5	5 - 8	0 - 2
METALS (MG/KG)						
ANTIMONY	0.34 UJ	0.58 J	0.44 UJ	0.93 J	0.37 UJ	0.34 UJ
LEAD	42.2 J	9.6 J	123 J	1050 J	12.2 J	36.1 J
MERCURY	0.069	0.0096 J	0.10	0.62	0.0048 J	0.027 J
PAHs (UG/KG)						
2-METHYLNAPHTHALENE	3.9 UJ	3.6 UJ	140 J	270 J	3.7 UJ	5.9 J
ACENAPHTHENE	3.9 U	3.6 U	420	830	3.7 U	32
ACENAPHTHYLENE	22	3.6 U	870	800	9.7	33
ANTHRACENE	17	3.6 U	2400	1500	7.1	120
BENZO(A)ANTHRACENE	41	4	3600 J	4200 J	22	230
BENZO(A)PYRENE	35	3.6 U	3000	4000	24	180
BENZO(B)FLUORANTHENE	41 J	4.3 J	3400	4800	30 J	170 J
BENZO(G,H,I)PERYLENE	23 J	3.7 J	1400	2500	24 J	78 J
BENZO(K)FLUORANTHENE	30	3.1 J	2600	2400 J	24	140
CHRYSENE	47	5.4	3900	5300	37	210
DIBENZO(A,H)ANTHRACENE	8.6	3.6 U	260	860	7.4	35
FLUORANTHENE	85	6.9	5200	7900	43	430
FLUORENE	9.8	3.6 U	1100	830	3.7 U	43
INDENO(1,2,3-CD)PYRENE	19	3.6 U	1400	2100	15	74
NAPHTHALENE	5.2 J	3.6 UJ	240 J	1100	4.2 J	9 J
PHENANTHRENE	65	5.3	5500	7200	30	330
PYRENE	76	5.8	4100 J	6500 J	36	350 J

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-21	OU9-21	OU9-21	OU9-22	OU9-22	OU9-22	OU9-22
LOCATION TYPE	SB	SB	SB	SB	SB	SB	SB
SAMPLE ID	OU9-SB-21-0205	OU9-SB-21-0508	OU9-SS-21-0002	OU9-SB-22-0205	OU9-SB-22-0508	OU9-SS-22-0002	OU9-SS-22-0002-D
NORTHING	92016.282	92016.282	92016.282	92021.907	92021.907	92021.907	92021.907
EASTING	2799708.584	2799708.584	2799708.584	2799649.998	2799649.998	2799649.998	2799649.998
SAMPLE DATE	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010
DEPTH INTERVAL (FT)	2 - 5	5 - 8	0 - 2	2 - 5	5 - 8	0 - 2	0 - 2
METALS (MG/KG)							
ANTIMONY	0.29 UJ	0.31 UJ	0.37 UJ	0.77 J	0.31 UJ	0.46 J	0.38 UJ
LEAD	45.2 J	15.1 J	38.1 J	267 J	118 J	26.3 J	23.4 J
MERCURY	0.063	0.0067 J	0.03 J	8.2	0.80	0.15	0.03 J
PAHs (UG/KG)							
2-METHYLNAPHTHALENE	4 UJ	3.5 UJ	32 J	14000 J	560000 J	87 J	26 J
ACENAPHTHENE	4 U	3.5 U	91	16000	100000	120 J	31 J
ACENAPHTHYLENE	27	3.5 U	47	7300	370000	2100 J	230 J
ANTHRACENE	15	3.5 U	170	38000	290000	1800 J	470 J
BENZO(A)ANTHRACENE	55	6.2	280	54000 J	410000 J	7500 J	1000 J
BENZO(A)PYRENE	68	8.5	250	51000	450000	7400 J	820 J
BENZO(B)FLUORANTHENE	72 J	9 J	230 J	58000	360000	8500 J	800 J
BENZO(G,H,I)PERYLENE	50 J	8 J	120 J	29000	230000	3600 J	280 J
BENZO(K)FLUORANTHENE	56	6.5	220	25000 J	130000 J	4800 J	690 J
CHRYSENE	75	9.3	300	54000	420000	8700 J	850 J
DIBENZO(A,H)ANTHRACENE	14	3.5 U	42	13000	66000	1600 J	130 J
FLUORANTHENE	110	11	450	91000	550000	11000 J	1100 J
FLUORENE	4.3	3.5 U	110	18000	320000	320 J	170 J
INDENO(1,2,3-CD)PYRENE	37	4.9	110	19000	160000	3500 J	220 J
NAPHTHALENE	7.4 J	3.5 UJ	70 J	15000	640000	210 J	32 J
PHENANTHRENE	54	6.9	600	110000	1300000	1100 J	1000 J
PYRENE	100	11	420 J	85000 J	910000 J	9700 J	1100 J

APPENDIX D

SOIL DATABASE PRINTOUT
OU9 REMEDIAL INVESTIGATION
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

LOCATION	OU9-23	OU9-23	OU9-24	OU9-24	OU9-25	OU9-25	OU9-25
LOCATION TYPE	SB	SB	SB	SB	SB	SB	SB
SAMPLE ID	OU9-SB-23-0204	OU9-SS-23-0002	OU9-SB-24-0204	OU9-SS-24-0002	OU9-SB-25-0205	OU9-SB-25-0508	OU9-SS-25-0002
NORTHING	92005.3326	92005.3326	91997.271	91997.271	91943.942	91943.942	91943.942
EASTING	2799580.56	2799580.56	2799551.866	2799551.866	2799514.773	2799514.773	2799514.773
SAMPLE DATE	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010	09/14/2010
DEPTH INTERVAL (FT)	2 - 4	0 - 2	2 - 4	0 - 2	2 - 5	5 - 8	0 - 2
METALS (MG/KG)							
ANTIMONY	0.46 UJ	0.48 J	0.35 UJ	2.3 J	0.38 UJ	0.38 UJ	0.45 UJ
LEAD	6.5 J	106 J	7.8 J	503 J	4.8 J	5.1 J	48.5 J
MERCURY	0.0085 J	0.20	0.012 J	0.50	0.0025 J	0.023 U	0.051
PAHs (UG/KG)							
2-METHYLNAPHTHALENE	3.6 U	23 J	3.7 U	39 J	3.6 U	3.6 UJ	4 U
ACENAPHTHENE	3.6 U	140 J	3.7 U	59	3.6 U	3.6 U	4 U
ACENAPHTHYLENE	3.6 U	43 J	3.7 U	190	3.6 U	3.6 U	4 U
ANTHRACENE	3.6 U	300 J	3.7 U	190	3.6 U	3.6 U	4.4
BENZO(A)ANTHRACENE	3.6 U	560 J	3.7 U	670 J	3.6 U	4.2	10
BENZO(A)PYRENE	3.7	290	3.7 U	680	3.6 U	4.3	11
BENZO(B)FLUORANTHENE	3.6 U	250 J	4	810	3.6 U	4.2 J	11
BENZO(G,H,I)PERYLENE	4.3	140 J	3.7 U	350 J	3.6 U	3.6 UJ	7.5
BENZO(K)FLUORANTHENE	3.6 U	360	3.7 U	290	3.6 U	3.6 U	4.3
CHRYSENE	3.6 U	630	3.7 U	660	3.6 U	7.8	11
DIBENZO(A,H)ANTHRACENE	3.6 U	77	3.7 U	170	3.6 U	3.6 UJ	4 U
FLUORANTHENE	4.1 J	1000	6.5 J	690	5.3 J	9.9	17 J
FLUORENE	3.6 U	190 J	3.7 U	100	3.6 U	3.6 U	4 U
INDENO(1,2,3-CD)PYRENE	3.6 U	130	3.7 U	240	3.6 U	3.6 UJ	5.2
NAPHTHALENE	3.6 U	48 J	3.7 U	60 J	3.6 U	3.9 J	4 U
PHENANTHRENE	4.1	1200	5	590	4.1	8.7	18
PYRENE	5 J	770 J	6.5 J	680 J	4.8 J	9.9	20 J

APPENDIX E

RESPONSE TO COMMENTS

E.1 RESPONSE TO COMMENTS ON DRAFT REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9

E.2 RESPONSE TO COMMENTS ON DRAFT FINAL REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9

E.1 RESPONSE TO COMMENTS ON DRAFT REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9

RESPONSES TO MEDEP COMMENTS DATED JUNE 17, 2011
DRAFT REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9
PORTSMOUTH NAVAL SHIPYARD, KITTERY, MAINE

Based on email discussions in September and November of 2011 and February 2012 regarding MEDEP comments, the Navy performed the overburden reevaluation calculation and recalculated background statistics and exposure point concentrations using ProUCL version 4.1.00. These revisions will be provided in the Draft Final OU9 RI Report.

General Comment

The Maine Department of Environmental Protection (MEDEP) has completed its review of the Draft RI report for OU9. Our comments follow. Note that some of our concerns regarding the Human Health Risk Assessment (HHRA) are similar to those expressed in our December 14, 2010 comments on the Draft OU7 RI. Having reached tentative agreement with the Navy on addressing the OU7 concerns during our April 8, 2011 conference call we are confident that similar agreements can be reached regarding any OU9 HHRA concerns.

Response: The issues from the OU7 RI Report that relate to the OU9 RI Report are provided in a table attached to these responses to comments. The table provides the first three columns for the action item resolution for OU7 (provided in Appendix E.2 of the Draft Final OU7 RI) and relevance of the issue to OU9, and how it is or will be addressed in the OU9 RI Report.

Specific Comment

1. **Comment:** Executive Summary, ES-1. "…therefore site contaminants do not contact groundwater." After this sentence please add something such as, "Leaching of contaminants to groundwater is not an issue at this site as discussed below."

   Response: The following will be added as the fourth sentence in the second paragraph on page ES-1:

   > "Leaching of contaminants to groundwater is not a concern because the site contaminants have relatively low water solubilities and typically bind to site soils and are relatively immobile."

2. **Comment:** 1.1 Purpose and Scope, p. 1-1. After the last sentence on the page indicate why bedrock groundwater at OU9 is not a concern.

   Response: To indicate why bedrock groundwater at OU9 is not a concern, the following sentence will be added after the last sentence on page 1-1:

   > "Groundwater in bedrock was not investigated because site contamination is present in soils located above bedrock and these contaminants are considered immobile, as detailed in Section 5.1."

3. **Comment:** 1.4. Summary of Environmental Concerns, p. 1-7, 2nd sentence. Please strike the word "clean" as the fill material has levels of PAHs above EPA screening levels and MEDEP residential soil guidelines.

Response: For clarity the 2nd sentence in the fifth paragraph of Section 1.4 referred to above will be revised to read as follows:

> "The majority of ash was excavated and the area backfilled with fill material from an off base borrow source (Shaw, July 2008)."

4. **Comment:** 2.2. Data Usability, p. 2-2. The second to last paragraph discusses unexpected lead and PAH results from the fill material and indicates additional samples were collected. The last paragraph only mentions lead. Please indicate whether or not additional elevated PAH concentrations were detected.

   Response: PAHs concentrations in the additional fill samples were similar to 2009 results. The following sentence will be added to the fifth paragraph of Section 2.2:

   > "Concentrations of PAHs in backfill material were similar to concentrations detected during the 2009 RI sampling event."

5. **Comment:** 2.2 Data Usability, p. 2-3 Bullet 1, last sentence. Please change the last "OU9-22" to "OU9-13."

   Response: The requested change will be made as requested.

6. **Comment:** 3.2.1 Shoreline Protection, p. 3-3. "The finished slope of the shoreline was 1:1 or less, as shown on as-built drawings." Is this sentence referring to the elevation contours shown on the as-built drawings? These are very difficult to read. Should this sentence have referred to Fig. 3-3, Cross-section B-B'?

   Also, the first section of this section seems to be missing some words from the end, probably "was installed."

   Response: The fifth sentence of Section 3.2.1 is referring to elevation contours shown on the as-built drawings as stated; however, one could also refer to Figure 3-3 to view the slope. The fifth sentence of Section 3.2.1 will be modified to read as follows:

   > "The finished slope of the shoreline was 1:1 or less, as shown on as-built drawings and Figure 3-3."

   The first sentence of Section 3.2.1 will be modified to read as follows:

   > "…and shoreline protection, with the approximate dimensions of 150 feet by 40 feet, using a 6-ounce geotextile separation layer and heavy riprap (stones with a minimum weight of 500 pounds and approximately 50 percent of stones less than 1,000 pounds) was installed."

7. **Comment:** 3.2.1 Shoreline Protection, p. 3-4. "As-built drawings of pre-excavation, excavated, and post-excavation topographic conditions are provided in Appendix A." It appears that only pre-excavation and post-excavation as-built drawings are provided in App. A.

   Response: Pre-excavation and excavated topographic as-built drawings are provided in Appendix A. The post-excavation figure will also be provided in Appendix A.

8. **Comment:** 3.5.2. OU9 Hydrogeology, p. 3-11. Please indicate that OU9 bedrock groundwater was not investigated and therefore no conclusions regarding groundwater properties can be made.

   Response: The following sentence will be added to the end of section 3.5.2:

   > "As discussed in Section 1.1 and detailed in Section 5.1, bedrock groundwater was not investigated; therefore, site-specific information on bedrock groundwater conditions are not available."

9. **Comment:** 3.8 Climatology, p. 3-14. "…because of its location near the ocean, there tends to be a little less snow and more rainfall in Portsmouth than in Portland." Both cities are essentially on the ocean. Therefore, it is unlikely that this is the reason for less snow in Portsmouth. Please revise or remove this statement.

   Response: The last sentence on page 3-14 will be deleted.

10. **Comment:** 4.0, Nature and Extent, p. 4-1, final paragraph. The maximum background concentration is relied on for more than just general understanding of nature and extent in this evaluation. The representative background concentrations are more appropriate, particularly since most of the site has fill at the surface.

    Response: Within the Nature and Extent discussion, maximum background concentrations from PNS were used to provide a point of comparison for the concentrations detected at OU9. The facility background concentration ranges are also included in the table presentation of data in Section 4.0. A statistical background comparison using representative background concentrations was performed to aid in the chemical of potential concern (COPC) selection process as part of the human health risk assessment, as discussed in Section 5.0.

11. **Comment:** Section 4.1, para. 2. Although PAH concentrations are not as high in the unexcavated area as those in the ash (10,000s mg/kg) there are 8 of 19 that exceed the industrial screening level. Please revise the text to indicate they are moderate *relative to the range of site concentrations*.

    Response: Paragraph 2 of Section 4.1 and the information in this comment is related to the excavated area, not the unexcavated area. The second sentence of the first paragraph on page 4-2, related to PAH concentrations in the excavated area, will be revised to read:

    > "…, and concentrations of PAHs were moderate to low, relative to the range of site concentrations."

12. **Comment:** 5.1.1. Polycyclic Aromatic Hydrocarbons, p. 5-2. In the first sentence of the last paragraph in this section please add "overburden" before "groundwater".

    Response: The first sentence of the last paragraph in Section 5.1.1 will be revised to read as follows:

    > "The mobility of PAHs via the groundwater pathway at OU9 is not considered significant because no overburden groundwater is present at the site."

13. **Comment:** 5.2.2, Potential Exposure Routes, p. 5-4, para. 2. "Recreational users are not likely to be exposed to soil in this area under current conditions because soil is covered with grass and trees."

    Grass is not a substitute for a true cover of hazardous materials, due to the reworking and mixing of soils by freeze-thaw, creation of dust if the grass is dead or dried out, etc. MEDEP understands the value of keeping remaining stands of trees in place at the Shipyard, but Navy must ensure that the grass is maintained to reduce exposure to the ash present in the unexcavated area.

    Response: For clarification, the fifth sentence of the second paragraph in Section 5.2.2 will be revised to read as follows:

    > "Future occupational and recreational exposure to surface soil is possible if the asphalt or grass cover is removed or not maintained."

14. **Comment:** 5.3. Contaminant Fate and Transport Summary, p. 5-5. In the last sentence add, "...as long as future site conditions remain equivalent to current site conditions."

    Response: There are small isolated subsurface pockets of burnt material/ash that could erode if brought to the surface. However, these do not present a significant contaminant migration pathway. For clarification, the last sentences in Section 5.3 will be revised to read as follows:

    > "The major transport mechanisms of OU9 contaminants are soil erosion and surface water runoff; however, because most of the site contamination was removed, offsite migration of remaining contamination in the subsurface is not expected under current or future site conditions. Subsurface soil contamination being brought to the surface in the future is unlikely because the majority of that contamination is near a main water line located near a steep slope adjacent to the coast. However, in the unlikely event that subsurface soil contamination was brought to the surface in the future, significant contaminant migration would not occur due to the minimal volume of contamination remaining on site."

15. **Comment:** 6.2.2 Selection of Chemicals of Potential Concern, p. 6-7. In the last sentence of the first paragraph, after "…not present at OU9" add language such as, "and, as discussed in Section 5.0, these compounds do not easily leach from soil."

    Response: Whether or not the site contaminants leach easily from soil does not affect the decision to not evaluate soil screening levels (SSL) for groundwater protection (for a drinking water exposure scenario). SSLs for groundwater protection were not evaluated because overburden groundwater is not present at the site; therefore, no change is proposed based on this comment.

16. **Comment:** 6.2.2. Background Concentrations Comparison, p. 6-7. "Several chemicals were not selected as COPCs based on the results of the background comparison." As stated in the 2009 MEDEP *Guidance for Human Health Risk Assessment for Hazardous Waste Sites*, "…neither USEPA nor DEP/MeCDC permits the exclusion of inorganic or organic compounds from the human health risk assessment based on comparison to background levels. As discussed in our April 8, 2011 call regarding the OU7 Draft RI Report, the MEDEP would be satisfied with a discussion and presentation of background cumulative risks (EPA Remedial Action Guidance for Superfund Table 9) in an appendix.

It is important to recognize that no contaminants from the fill should be eliminated as COPCs based on background, even taking into account Navy policy. This is because the fill material in no way reflects background Shipyard activity as it was imported from off Seavey Island.

Nevertheless, as long as the cumulative risks are presented in the report as discussed above, the proper management decisions can be made.

Response: Navy policy is to eliminate from the baseline risk assessment process both naturally occurring and anthropogenic chemicals present at concentrations less than background and document these chemicals in the corresponding report. Whether or not the fill material used at OU9 reflects background Shipyard activity is irrelevant. The contamination in that fill material is either naturally occurring or from an anthropogenic source and is present at levels less than background; therefore, those contaminants in the fill material should be eliminated as COPCs based on Navy background policy.

Potential cumulative risks, including chemicals attributed to background, were calculated and presented in Appendix C.3. A brief summary of the information presented in the RAGs Part D tables in Appendix C.3 will be added to the appendix. A statistical evaluation (in Appendix B) was conducted to support identification of chemicals similar to background. A discussion of potential risks from chemicals eliminated due to background is presented in Section 6.5.

17. **Comment:** 6.3.4 Exposure Point Concentrations, p. 6-12. EPCs must be calculated for contaminants eliminated as COPCs based solely on background.

    Response: EPCs for these chemicals are presented in Appendix C.3, which presents cumulative risks, including chemicals attributed to background. Reference to EPCs being presented in Appendix C.3 will be added to Section 6 text.

18. **Comment:** 6.4.3 Toxicity Criteria for Carcinogenic Effects of PAHs, p. 6-16. Please clarify how the default ADAFs were selected.

    Response: The default ADAFs are from the USEPA guidance document Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens.

    The text will be modified to read as follows to identify the source of the ADAFs:

    > "…the following defaults from USEPA guidance (March 2005b) were used: 10 for ages 0 to 2, three for ages 2 to 16, and one (no adjustment) for ages 16 to 70.

19. **Comment:** 6.5 Risk Characterization, p. 6-16. "…contaminants with concentrations that exceed screening levels but that do not exceed site background levels are likely representative of regional contamination, not site-related contamination." Clearly contaminants in the fill are not a result of past Site 34 activities. Nevertheless, these contaminants came to be located at Site 34 due to Navy activities. Therefore the Navy must calculate risks for all compounds in the fill with maximum concentrations greater than the RSL for carcinogens or one-tenth the RSL for non-carcinogens.

    Response: No revision to the calculation of risk is necessary based on this comment. Please see the Navy's response to MEDEP comment number 16.

20. **Comment:** 6.7.1.3 Exposure to Lead, p. 6-34. "…lead concentrations were determined to be within site background concentrations. Therefore, adverse receptor effects are not anticipated due to soil lead exposure at OU9." The fact that site concentrations are within background concentrations has nothing to do with whether or not adverse effects will occur. Adverse effects may occur if concentrations, background or site-related, exceed some risk level. Please strike this sentence.

    Response: For clarification the second sentence of Section 6.7.1.3 will be deleted and the following text will be added to the end of the first sentence in that section:

    > "…; however, blood-lead concentrations were modeled for the background evaluation, as described below."

21. **Comment:** 7.1.2 Fate and Transport of Contaminants, p. 7-2. Please add a brief discussion to this section indicating that leaching of contaminants from subsurface soil to bedrock groundwater is not a concern since PAHs tend to bind to soil particles (as discussed earlier in the report).

    Response: The following statement will be added as the fourth sentence of Section 7.1.2 to indicate that leaching to bedrock groundwater is not a concern:

    > "Contamination is not expected in bedrock groundwater because the site contaminants (PAHs) present in subsurface soil located above the bedrock have relatively low water solubilities and tend to bind to soil particles rendering them immobile."

22. **Comment:** 7.2.1 Conclusions, p. 7-4. "Based on the risk evaluation, subsurface soil is a potential medium of concern for OU9." Based on the risk evaluation surface soil is also a potential medium of concern for OU9 when comparing to MEDEP's target ILCR of $1x10^{-5}$. Please incorporate this information into Section 7 using language similar to that used in Section 7 of the OU7 RI.

    Response: Surface soil is acknowledged as exceeding the State of Maine cancer risk guideline in Section 7.1.3 Risk Assessment, which is consistent with the OU7 RI Report. See page 7-3 of the OU9 RI.

23. **Comment:** Appendix A.1, Table A-2. The overburden calculation needs to be limited to the 10-foot depth evaluated by the risk assessment. The most likely exposures are in the top five feet, ash is fairly widespread spatially across the site, and inclusion of depths beyond 10 feet simply dilutes the percent ash present at the site. This volumetric approach is interesting, but may under-represent risks. If this were applied to sites with deep overburden, virtually any concentration could be present below 2 feet and would be interpreted to represent no risk.

    In addition, although ash is certainly associated with the highest PAH values, there are several borings with benzo(a)pyrene equivalents in the range of 1-58 mg/kg that have no ash identified in their logs, often in the recent fill material. These locations include OU-15, OU-18, OU-19, OU-20 and OU-22. Were these concentrations applied to ash or non-ash portions of the site? MEDEP was unable to locate the calculations for the weighted EPC values, to confirm which concentrations were applied to ash vs non-ash soils. Please reference their location or provide the calculations.

Response: a.)The overburden calculation was reevaluated limiting sample depths to 10 feet bgs. Only 16 of 136 sample evaluated were deeper than 10 feet, the deepest being 17 feet bgs and most around 11 to 13 feet bgs. The updated recalculation in Table A-2 of Appendix A shows no change to the overall conclusion that approximately 5 percent of the site subsurface soil contains burnt material/ash.

b.) Concentrations of chemicals in soil were not considered when determining percent ash. Locations OU-15 and OU9-22 were updated in Appendix A tables to be listed as containing ash/burnt material. However, there was not a discernible layer or depth of ash/burnt material in OU9-15 so it was not applied to the ash portion of the site in the calculation. Sample location OU9-22 was applied to the ash portion of the site. Sample locations OU-18, OU19, and OU-20, were applied to non-ash portions of the site.

c.) Weighted EPC values are 95% Upper Confidence Limits calculated on weighted average concentrations using the T-statistic, as presented in Appendix C.2. Tables presenting weighted EPCs will be updated to list sample locations applied to ash/burnt material soils. Example calculations will be added to Appendix C.2.

24. **Comment:** Section 4 and Appendix B. The graphical evaluation and the data tables indicate that a new approach is needed for the background comparisons of compounds where the detection limit in new site samples is multiple orders of magnitude lower than detection limits for background samples. This is an issue for the PAHs and to a lesser extent antimony and mercury, particularly where ½ the detection limit is used in calculations and plots.

    Based on the data tables the full background dataset was utilized rather than the screened version described in the Facility Background Study Development report that removes outliers and the BGS-05 location. Please revise the tables and the background evaluation as needed or justify inclusion of the full dataset.

    Response: The background analysis for OU9 was performed in accordance with Procedural Guidance for Statistically Analyzing Environmental Background Data (NAVFAC, September 1998) and Guidance for Environmental Background Analysis Volume I: Soil (April 2002), and USEPA's Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (USEPA, September 2002). The background dataset was evaluated previously for outliers, in accordance with the USEPA's Background Guidance, and as stated in the responses to MEDEP comment 5 on the Draft Site 34 SSI, the background datasets were found to contain no outliers (Tetra Tech, August 2004). Background sample BGS-05 was not used in the background analysis as this location was determined to be associated with OU7 and not representative of background concentrations. The same background methodology and data set were used in the OU7 RI Report (Tetra Tech, July 2011). Therefore, no changes are necessary for the background evaluation.

25. **Comment:** App. B, Background Comparisons, Methodology, p. 1. Please indicate what software package was used to perform the various tests, e.g. Quantile test, Gehan test, etc.

    Response: ProUCL 4.1.00 was used to conduct the Wilcoxon Rank Sum Test, Quantile Test, and Gehan Test. Summary statistics, data distribution, and graphical displays were conducted using the statistical package R version 2.9.2. The Slippage Test was computed by hand.

26. **Comment:** Appendix B, Background Comparisons, Table 1. Note 4 indicates that if more than 4 site concentrations are greater than the maximum background concentration the site is shifted above background. Is that value of 4 based on numbers of samples or other factors?

    Response: The four site concentrations referenced in Note 4 are the critical values for the Slippage Test. There are different critical values for various combinations of site and background samples sizes. The critical values for the Slippage Test as stated in Note 4 are from Table C-3 of Guidance for Environmental Background Analysis Volume I: Soil, NFESC User's Guide UG-2049-ENV April 2002.

LIST OF OU7 ACTION ITEMS FROM APRIL 8, 2011 CONFERENCE CALL THAT APPLY TO OU9

OU7 RI Comment/Issue[i]	Summary of Conclusions for OU7 RI[i]	Action Item for OU7[i]	Applies to OU9
No. 34/Chemical of Potential Concern (COPC) screening based on background. MEDEP requested that the RI Report include information to show cumulative risks that include chemicals screened out based on the background comparison so that risk information is available in the document.	Navy policy is to present baseline risks without chemicals that represent background. A statistical evaluation (in Appendix B.2) was conducted to support identification of chemicals similar to background. The draft OU7 RI provides the evaluation of chemicals screened out based on background in the uncertainty section (Section 6.6). Potential risks for these chemicals were calculated and presented in Appendix D.7.3 Cumulative risks were not provided; however, information is available to calculate cumulative risk. Based on the conference call discussion, the Navy agreed to provide cumulative risk calculation in Appendix D.7. No change to the risk conclusions in Section 7.0 is needed based on the discussion.	Tetra Tech will prepare cumulative risk tables (RAGS Part D tables) to include in Appendix D.7 and any text revisions based on the discussion and provide these to the Navy for distribution to the team.	Yes. Cumulative risks including background are provided in Appendix C.3 and discussed in Section 6.5.5 of the draft OU9 RI. An introductory text will be added to Appendix C.3 to explain the contents of that appendix.
No. 16/PCBs (Aroclors) as COPCs. Aroclor 1248 and Aroclor 1260 were screened out as COPCs based on frequency of detection; however, there were some samples that had elevated detection limits and the maximum detections were much greater than the screening levels. MEDEP requested that these Aroclors be added as COPCs and included in risk calculations.	A small number of samples had elevated detection limits for these Aroclors and this would not change the conclusions to screen out these chemicals based on low frequency of detection. However, the project team previously identified a PCB hot spot after the 2003 Phase I RI sampling and further investigated the hot spot area as part of the 2008 Phase II RI sampling. Therefore, PCBs were evaluated in the uncertainty section (Section 6.6) in the draft RI and PCBs were included as chemicals of concern (COCs) (Section 6.7.3). The Navy agreed to include Aroclor 1248 and Aroclor 1260 in the calculation of cumulative risks in Appendix D.7 . No change to the risk conclusions in Section 7.0 is needed based on the discussion.	Tetra Tech will prepare cumulative risk tables to include in Appendix D.7 and any text revisions based on the discussion and provide these to the Navy for distribution to the team.	No. PCBs are not COCs for OU9.
Nos. 47 and 51/Exposure assumptions for intertidal area. MEDEP agrees with the exposure assumptions the Navy proposed based on current site conditions, but is concerned that if site conditions changed, the exposure assumptions may not be valid. MEDEP requested that text be added to clarify the basis for the exposure assumptions, and that these are based on current conditions.	In the past, contaminated fill material at OU7 eroded from the shoreline to offshore sediment that caused contamination in the sediment. A shoreline revetment was placed as part of the 2006 removal action to prevent further erosion. Concerns for future erosion are discussed in the RI (Section 5.3), and the risk conclusions indicate that shoreline controls are needed to prevent contaminated fill along the shoreline from eroding in the future (Section 7.2.1). The controls cover the mid- to high-tide zone of the shoreline and only sediment below the mid-tide level is exposed. The sediment in the low-tide zone is soft, hard to walk on, and only exposed for a short time of the tidal cycle. Therefore, the human health exposure assumptions are valid for current conditions. Information on current shoreline conditions is provided in Section 3.2.1 of the RI. The Navy agreed to include a reference to or additional discussion of the shoreline in the risk section (Section 6.3.5) to provide the basis for the exposure assumptions in the HHRA. Uncertainty related to future shoreline conditions will be discussed in the uncertainty section. No change to the risk conclusions in Section 7.0 is needed based on	Tetra Tech will prepare text revisions to expand on the justification for the exposure assumptions for the intertidal area in the HHRA and provide these to the Navy for distribution to the team.	No. Intertidal exposure is not relevant to OU9.

LIST OF OU7 ACTION ITEMS FROM APRIL 8, 2011 CONFERENCE CALL THAT APPLY TO OU9

OU7 RI Comment/Issue[i]	Summary of Conclusions for OU7 RI[i]	Action Item for OU7[i]	Applies to OU9
	the discussion.		
No. 37/Presentation of risk drivers that exceed Maine risk guidelines in the risk assessment. MEDEP requested that text be added to Section 6.7.3 to discuss the carcinogenic risk drivers based on Maine guidelines and not only refer to Tables 6.1 and 6.2 for the information.	The Navy expressed concern with use of Maine risk guidelines for risk management or development of cleanup levels because these guidelines are not promulgated. The Maine risk guidelines are not included as regulatory requirements in the OU2 Feasibility Study (FS) (April 2011) or OU1 Record of Decision (ROD) (September 2010). MEDEP indicated that the information was being requested for the risk assessment (Section 6.7.3) for completeness and was not requesting the Maine risk guidelines to be used for making risk management decisions or developing cleanup levels for OU7. The Navy agreed to include the text noting risk drivers based on Maine risk guidelines with clarification that the Maine guidelines are not regulatory requirements for cleanup. The clarification will also be included in Section 7.0 text. No change to the risk conclusions is needed based on the discussion.	Tetra Tech will prepare text revisions for Sections 6 and 7, and provide these to the Navy for distribution to the team.	Yes. The information is provided in the draft OU9 RI (see Section 6.5.3).
No. 31/Vapor intrusion evaluation is not necessary for OU7 because volatile contaminant levels are low. MEDEP agrees with the Navy response and requested that supporting information for why vapor intrusion was not a pathway of concern be included in the Section 6 of the RI.	The Navy agreed to include the clarifying text in Section 6.0, based on information in the Navy's response. No change to the risk conclusions is needed based on the discussion.	Tetra Tech will prepare text revisions and provide these to the Navy for distribution to the team.	Yes. Vapor intrusion is discussed in the draft OU9 RI briefly on p. 6-10. Additional text regarding contaminants not being a vapor intrusion concern will be added to the text to Section 6.
No. 32/Former Location of Building 237 Decision Unit. MEDEP agreed with the Navy's response and with the information included in the text.	Based on discussion, it was agreed that the text revisions proposed in the March 2011 response to comment is sufficient and no additional revisions are needed.	No additional action required.	No. This is an OU7 issue only.

LIST OF OU7 ACTION ITEMS FROM APRIL 8, 2011 CONFERENCE CALL THAT APPLY TO OU9

OU7 RI Comment/Issue[i]	Summary of Conclusions for OU7 RI[i]	Action Item for OU7[i]	Applies to OU9
No. 36/Hexavalent chromium. MEDEP expressed concern with documentation that hexavalent chromium is not a COPCs for OU7 and that trivalent chromium is an appropriate surrogate for total chromium results.	The decision that hexavalent chromium and other chemicals (VOCs and cyanide) are not COPCs was made as part of the development of the RI sampling plan (in 2003). Hexavalent chromium was not detected in the one surface soil sample that was analyzed for hexavalent chromium and was only detected in one of seven subsurface soil samples at concentrations below the screening value. Based on the hexavalent chromium data from the SSI the OU7 RI QAPP concluded that additional sampling for hexavalent chromium was not required. Therefore, none of the RI samples were analyzed for hexavalent chromium. Text in the RI may need to provide additional clarification as to why hexavalent chromium is not a COPC and that trivalent chromium is an appropriate surrogate for total chromium results in the risk assessment.	MEDEP will review the RI QAPP to see whether they have any further questions. Tetra Tech will review the text and RI QAPP to determine any additional text revisions to clarify use of trivalent chromium as surrogate in the risk assessment. [Post Meeting Note: MEDEP stated in an email dated April 20, 2010 that additional justification for the assumption that trivalent chromium is an appropriate surrogate for total chromium is not needed. Text justifying the use of trivalent chromium as a surrogate will be added to Section 6.6.3].	No. Chromium is not a COC for OU9.
ProUCL potential change in EPCs based on recent update to program (the current version of ProUCL at the time the risks were calculated was 4.00.04, EPA recent released version 4.1.00).	Approximately six weeks ago, EPA issued a new version of ProUCL, 4.1.00 that addresses an error in EPA's program. Based on the ProUCL 4.1.00 Technical Guidance, "All known software bugs found by the various users and developers of ProUCL 4.00.05 (and earlier versions) and most of the suggestions made by the users have been addressed in ProUCL 4.1.00." To ensure that any of the "software bugs" in the previous version do not adversely impact the risk calculations in the OU7 RI, UCLs for the RI will be recalculated using ProUCL 4.1.00. The updated version may or may not impact the calculation of exposure point concentrations (EPCs). The Navy will confirm whether there are any changes in the calculations in the OU7 RI.	Tetra Tech will evaluate the updated version and provide the information to the Navy for distribution to the team.	Yes. UCLs for the RI will be recalculated using ProUCL 4.1.00. The updated version may or may not impact the calculation of exposure point concentrations (EPCs). The Navy will confirm whether there are any changes in the calculations in the OU9 RI.

[i] Taken from the OU7 Action Item List included in Appendix E.2 of the OU7 RI Report.

E.2 RESPONSE TO COMMENTS ON DRAFT FINAL REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 9

NAVY RESPONSES TO MEDEP FOLLOW-ON COMMENTS DATED MAY 2, 2012 ON NAVY RESPONSES DATED FEBRUARY 20, 2012 TO MEDEP COMMENTS DATED JUNE 17, 2011 IN THE DRAFT FINAL REMEDIAL INVESTIGATION REPORT FOR OU9 PORTSMOUTH NAVAL SHIPYARD, KITTERY, ME

Comment: The Maine Department of Environmental Protection (MEDEP) has reviewed the Navy's responses referenced above. In general, MEDEP believes the responses are satisfactory. However, we have comments regarding the background analysis discussed in the response to MEDEP Comment 24.

The Navy references its Aug. 2004 response to MEDEP Comment 5 on the Draft Site 34 SSI that indicates that the background datasets contained no outliers.

That response states that the background analysis was performed in accordance with the most recent, as of 2004, Navy and EPA background documents. However, these documents state that a possible solution to including non-detect concentrations in a data set is to use one-half the detection limit (dl/2). Since these documents were published use of this approach has been shown to produce an artificial signal in the dataset such that conclusions based on this dataset may be significantly inaccurate.

Current statistical practice for environmental data strongly discourages the use of replacing a fixed value for non-detects (e.g., EPA, 2009; Singh et al, 2010; Helsel 2012) especially for calculating summary statistics. For data that have multiple detection limits, as is the case here, substitution of detection limits for non-detects results in the introduction of unrelated patterns into the data. More robust and accurate methods, such as maximum likelihood estimation (MLE), Kaplan-Meier nonparametric method, or regression on order statistics (ROS) are available and should be used instead of data substitution (fabrication).

We note that the latest user's guide for ProUCL, ProUCL Version 4.0 Technical Guide, EPA states,

> "Note: It should be noted that for data sets with NDs, the DL/2 substitution method has been incorporated in ProUCL 4.0 only for historical reasons and also for its current default use. It is well known that the DL/2 method (with NDs replaced by DL/2) does not perform well (e.g., Singh, Maichle, and Lee (EPA 2006)) even when the percentage of NDs is only 5%-10%. It is strongly suggested to avoid the use of DL/2 method for estimation and hypothesis testing approaches used in various environmental applications. Also, when the % of NDs becomes high (e.g., > 40%-50%), it is suggested to avoid the use of parametric MLE methods. For data sets with high percentage of NDs (e.g., > 40%), the distributional assumptions needed to use parametric methods are hard to verify; and those parametric MLE methods may yield unstable results… The main reason of its common use has been the lack of the availability of other defensible methods and associated programs that can be used to estimate the various environmental parameters of interest. Today, several other methods (e.g., KM method, bootstrap methods) with better performances are available that can be used to compute the various upper limits of interest. Some of those parametric and nonparametric methods are now available in ProUCL 4.0. Even though the DL/2 method (to compute UCLs, UPLs, and for goodness-of-fit test) has also been incorporated in ProUCL 4.0, its use is not recommended due to its poor performance". (USEPA, 2007)

MEDEP has received the Navy's Draft Re-Evaluation of the May 2000 Facility Background Report and have begun to review it. It is our hope that this re-evaluation does not use the ND/2

method, except for comparison, and will provide more accurate information regarding the background data set. Any issues related to the Draft Re-Evaluation will be discussed separately from the OU9 RI Report discussion.

If the re-evaluation of the background data set indicates that additional concentrations of OU9 CoC's are above background than previously thought, MEDEP, USEPA and the Navy will have to determine if further work is needed at the site.

Response: The background evaluation presented in the OU9 RI consisted of two parts: 1) hypothesis tests statistically comparing the site data to the background data and 2) graphical displays used for comparison purposes only. The conclusions as to whether site concentrations are similar to background or greater than background were based on the hypothesis tests. For the hypothesis tests (i.e., Wilcoxon Rank Sum Test, Gehan Hypothesis Test, Slippage Test, and Quantile Test) the full detection limit was entered into ProUCL Version 4.1.00 for non-detected concentrations. For the graphical displays, which were used for comparison purposes only to verify the results of the hypothesis tests, one-half the detection limit was used for non-detected concentrations. Note when the full detection limit is used for the graphical displays for the OU9 evaluation the overall conclusions about site concentrations being greater than or equal to background concentrations does not change.

The last sentence of the second paragraph of the Methodology Section in Appendix B of the OU9 RI will be removed and replaced with the following text, "For all hypothesis tests the full detection limit was used for nondetected concentrations. For the graphical displays, which were used for comparison to the hypothesis tests, ½ the detection limit was used for nondetected concentrations. The average value was used for duplicate pairs."

Please note that the latest user's guide for ProUCL is the ProUCL Version 4.1.00 Technical Guide (Draft) and neither section of ProUCL Version 4.0 Technical Guide referenced text in the comment above is relevant to computing hypothesis tests for background comparisons which was the main function of the background evaluation in the OU9 RI. The first section of ProUCL Version 4.0 User's Guide referenced text (Starting with "Note:..." and ending with "unstable results…") comes from page 9 of that document and discusses the calculation of upper limits. The remaining text referenced is from Section 1.10.1 which is titled "Avoid the use of DL/2 Method to compute UCL95."

The Navy does agree with Section 6.9 of ProUCL Version 4.1.00 Technical Guide (Draft) titled "Nonparametric Test" which states:

> "Note: *Once again, it is suggested to avoid the use of DL/2 method (e.g., replacing NDs by respective DL/2 values or some other substitution values) to perform hypotheses testing approaches. ProUCL 4.0 provides alternative methods (e.g., WMW test, Gehan test) that may be used when data sets consist of ND observations."*