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NSWC WHITE OAK
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POST REMOVAL ACTION REPORT SITE 7 NSWC WHITE OAK MD
2/1/2003
TETRA TECH

Post-Removal Action Report
for
Site 7

Former
Naval Surface Warfare Center
White Oak
Silver Spring, Maryland

Engineering Field Activity Chesapeake
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888
Contract Task Order 0836

February 2003

TETRA TECH NUS, INC.

REVISION 0
FEBRUARY 2003

POST-REMOVAL ACTION REPORT
FOR
SITE 7

FORMER
NAVAL SURFACE WARFARE CENTER
WHITE OAK
SILVER SPRING, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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CONTRACT TASK ORDER 0836

FEBRUARY 2003

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ACRONYMS

ALC	Adelphi Laboratory Center
BCT	BRAC Clean-Up Team
BERA	baseline ecological risk assessment
BRAC	Base Realignment and Closure
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-Term Environmental Action Navy
COPC	chemical of potential concern
CTO	Contract Task Order
EE/CA	Engineering Evaluation / Cost Analysis
EFACHES	Engineering Field Activity Chesapeake
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
GSA	General Services Administration
HHRE	human health risk evaluation
IRP	Installation Restoration Program
NSWC	Naval Surface Warfare Center
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCOC	potential chemical of concern
PRG	preliminary remediation goal
RAC	Remedial Action Contractor
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RFA	RCRA facility assessment
RFI	RCRA facility investigation
SAP	Sampling and Analysis Plan
SS	site screening
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	Target Analyte List
TCL	Target Compound List
TtNUS	Tetra Tech NUS, Incorporated
USNR	United States Naval Reserve
VOC	volatile organic compound

1.0 INTRODUCTION

The Engineering Field Activity Northeast of the Naval Facilities Engineering Command has issued Contract Task Order (CTO) 836 to Tetra Tech NUS, Incorporated (TtNUS) under Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract No. N62467-94-D-0888. Under CTO 836, TtNUS is documenting the completion of a removal action at Site 7, the Ordnance Burn Area, at the former Naval Surface Warfare Center (NSWC) White Oak, located in Silver Spring, Maryland.

The work is part of the Navy's Installation Restoration Program (IRP), which is designed to identify contamination at Navy and Marine Corps facilities resulting from past operations and to institute corrective measures, as needed. The Navy, as part of the NSWC White Oak Base Realignment and Closure (BRAC) Clean-Up Team (BCT), determined that a time-critical removal action at Site 7 was appropriate under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). An Action Memorandum was published in July 2002, and the removal action commenced in August of the same year. The removal action addresses the excavation and off-site disposal of contaminated soil.

This Post-Removal Action Report discusses the site history and remedial action associated with Site 7 and the verification sampling activities that occurred in support of the removal action. Detailed discussions regarding soil and sediment excavation, erosion/sediment control, site clearing, transportation and off-site disposal of nonhazardous material, and site restoration are not provided in this document. The Remedial Action Contractor (RAC), Shaw Environmental and Infrastructure, is preparing the Removal Action Report, which will contain information about the removal action activities.

The verification sampling activities were performed in conjunction with procedures set forth in the Verification Sampling and Analysis Plan for Site 7 (TtNUS, 2002) and the Master Work Plans for the former NSWC-White Oak (Brown & Root Environmental, 1998).

1.1 FACILITY DESCRIPTION

NSWC-White Oak was a Navy-owned and -operated facility for naval surface warfare research. The facility is located approximately 5 miles north of Washington, D.C., adjacent to New Hampshire Avenue in Silver Spring, Maryland (see Figure 1-1). NSWC-White Oak covers approximately 710 acres and is located in both Prince George's and Montgomery Counties. Adjacent to the southern corner of the property is the U.S. Army's Adelphi Laboratory Center (ALC) and the United States Naval Reserve (USNR) Training Center. A mixture of residential, park, industrial, and commercial properties border the

remainder of the facility. After the facility was closed, the property was transferred to the General Services Administration (GSA) and the U.S. Army. Figure 1-2 identifies the location of Site 7.

1.2 SITE DESCRIPTION

1.2.1 Site Location and History

Site 7 was reportedly used for the thermal destruction of waste ordnance compounds between 1948 and 1968. Site 7 is located north of Dahlgren Road and the fenced area that contains Buildings 501, 506, and 508 and is approximately 300 yards southeast of Site 4 (Chemical Burial Area). Buildings 501 and 506 were previously used for the storage of hazardous wastes. Figure 1-3 depicts Site 7 surface features and topography.

The site consists of a slightly depressed swale approximately 250 feet long and 20 feet wide. The remainder of the area adjacent to the swale is either cleared or covered by woodland or grass. The site is relatively flat with a gentle slope to the east.

The swale is relatively flat and narrow at its westernmost point and widens out downgradient to the east. The swale joins another surface drainage feature and passes under Perimeter Road via a culvert approximately 400 feet east of the origin of the swale near Buildings 501 and 508. As reported in 1999, the culvert was completely plugged with leaves and other debris, inhibiting water flow under the road. The swale is located in a wooded area and water is present only after periods of heavy rainfall. Since the swale is relatively flat and wide in the wooded area and along Perimeter Road, rainfall ponds and infiltrates. The swale was completely dry during a November 1997 site visit (TtNUS, 1999). No aquatic or semi-aquatic community is present in the swale.

Waste disposed at this site included various types of explosives, primarily nitroaromatics and nitroaliphatics. It has been reported that approximately 33,000 pounds of explosives were burned at this site over a period of 20 years.

1.2.2 Previous Investigations

The following section presents information that pertains to Site 7 studies and investigations. Historical analytical data is presented in Appendix A. Locations of site monitoring wells are shown on Figure 1-3.

1.2.2.1 Initial Assessment Study

The earliest site investigation consisted of the Initial Assessment Study (IAS) by the Naval Energy and Environmental Support Activity (NEESA, 1984). This investigation did not involve any intrusive

investigations or field sampling. Completed in November 1984, the IAS identified wastes that were potentially disposed at Site 7 and the period of time during which the site was active. This information was ascertained through a review of the operational history of the site and other relevant documents, plus interviews with facility personnel. The recommendation of the IAS was that Site 7 (and six other sites) required additional study.

1.2.2.2 Confirmation Study, Verification Phase

A Confirmation Study (CS), Verification Phase was conducted in September 1985 by Malcolm-Pirnie (Malcolm-Pirnie, 1987). The study was conducted to confirm the findings of the IAS and to obtain additional information for characterizing the site and identifying site hazards. The CS involved the installation of one groundwater monitoring well (7GW08) and advancement of 54 soil borings within swale area. Soil samples were collected at the surface and at one-foot intervals to a total depth of five feet at all locations. All surface, 1-foot, and 2-foot deep samples were analyzed, with the analysis of deeper samples performed only when nitroaromatic contamination was identified in the shallower samples.

Monitoring well 7GW08 was sampled on two occasions (events A and B) during this investigation. This study concluded that further study was warranted.

1.2.2.3 RCRA Facility Assessment

Following the submission of the revised RCRA Part B permit application in 1988, a RCRA Facility Assessment (RFA) was conducted by a contractor for the U.S. Environmental Protection Agency (EPA) in November 1990 (Kearney/Centaur Division, 1990). The RFA identified 97 Solid Waste Management Units (SWMUs) and 19 Areas of Concern (AOCs) at NSWC-White Oak. All 14 of the IRP sites identified in the IAS were also identified as SWMUs or AOCs. In the RFA report, 40 SWMUs were recommended for a RFI, which would assess the presence and migration of potential contaminants of concern (PCOCs). Seven of the IRP sites, including Site 7, were identified for a RFI.

In September 1992, Malcolm-Pirnie completed an RFA review for the Navy, which evaluated the applicability of the general recommendations of the RFA to the individual SWMUs. Generally, for those SWMUs that were being investigated under the IRP, it was concluded that the planned level of effort was sufficient to address potential impacts from those SWMUs. It was also concluded that some level of sampling would probably be required for most of the SWMUs and AOCs that were recommended for a RFI or verification sampling.

1.2.2.4 Phase I and II Remedial Investigation

Phase I and II Remedial Investigation (RI) activities were conducted between January 1989 and March 1992 by Malcolm-Pirnie (Malcolm-Pirnie, 1992). The RI was conducted to further characterize hazards associated with Site 7 as well as other sites. During the Phase I RI, 59 soil samples were collected from 27 locations (7SB01 through 7SB27). The hand auger borings were advanced to a depth of five feet and were used to characterize the nitroaromatic concentrations in the subsurface soil within the swale.

Two groundwater monitoring wells (7GW41 and 7GW43) and one piezometer (7PZ42) were installed during the Phase I investigation. The new and existing wells were sampled during this phase of the investigation.

During the Phase II RI, two soil borings (7SB28 and 7SB29) were advanced to a depth of 15 feet, with samples collected at 5, 10, and 15 feet below the ground surface. The samples were collected to characterize the vertical extent of contamination in the shallow soil within and just beyond the limits of the swale.

The three existing monitoring wells were again sampled during the Phase II investigation. Slug tests were performed at monitoring wells 7GW41 and 7GW43.

1.2.2.5 Draft Feasibility Study

A Draft Feasibility Study (FS) was completed in 1993 by Malcolm-Pirnie (Malcolm-Pirnie, 1993). The FS concluded that a significant threat to human health and the environment existed through potential exposure to nitroaromatic and volatile organic contaminants in soil and groundwater. The Draft FS was not finalized.

1.2.2.6 Wetland/Forest Stand Delineation

A basewide study was conducted in 1995 (HNUS, 1995) to identify and delineate wetlands and forest stands throughout NSWC. This report concluded that wetlands were not within the Site 7 area. While no forest cover was identified at Site 7, Mixed Deciduous, Virginia Pine, and Successional Hardwood Forest stands are present at the borders of the site.

1.2.2.7 Groundwater and Background Characterization Study

During June 1997 the three existing groundwater monitoring wells and one existing piezometer were sampled and analyzed at Site 7 for low concentration Volatile Organic Compounds (VOCs) and Semivolatile Organic Compounds (SVOCs) as well as Target Analyte List (TAL) inorganics, cyanide,

Target Compound List (TCL) pesticide/polychlorinated biphenyls (PCBs), and explosives. This sampling was performed as part of a facility-wide groundwater investigation. Additional activities were performed in the fall of 1997 to characterize background soil, sediment, groundwater, and surface water. A Background Investigation (BI) report was issued in December 1998 (TtNUS, 1998) for the former NSWC White Oak.

1.2.2.8 Site 46 Site Inspection

In the fall of 1995, contaminated surface water and groundwater was detected on properties adjacent to the former NSWC-White Oak (TTNUS, 2000). A potential source area, known as Site 46, was identified on the former NSWC-White Oak, and a Site Inspection (SI) was undertaken to characterize the site and the nature and extent of contamination. The SI was completed in 1998 and identified several potential source areas within and adjacent to Site 46 associated with surface and groundwater contamination.

Site 7 was one of these potential areas due to the location of Site 7 upstream of Site 46 on Floral Drive Stream. Site 7 was investigated to determine if the area may be the source for the trace levels of explosives at Site 46. The pattern of detections and concentrations did not indicate any significant impacts due to releases of inorganics, as there were no identifiable trends of increasing inorganics concentrations from the upstream to downstream samples, nor were the concentrations above the background levels. Trace levels (<5 µg/L) of two explosives, HMX and RDX, as well as a variety of inorganics were detected in the surface water. No pesticides, PCBs, or explosives were detected in sediment in this stream.

1.2.2.9 RCRA Facility Investigation

A RFI was performed and completed in September 1999 (TtNUS, 2000). Six surface and subsurface soil samples were collected at Site 7 during the RFI field activities. Surface soil samples (0 to 6 inches) and subsurface soil samples (2 to 4 feet) were collected at four locations (7SB102, 7SB103, 7SB104, and 7SB106) within the burn area. Surface and subsurface soil samples were also collected from two locations in the ephemeral drainage east of the site (7SB101 and 7SB105).

Nine groundwater samples were collected at Site 7 during the first quarter sampling event from the four existing monitoring wells (7GW08, 7GW41, 7GW43, and 7GW101), one existing piezometer (4PZ42), and four newly installed monitoring wells (7GW102, 7GW103, 7GW104, and 7GW105). One existing monitoring well (4GW100) from Site 4 was used to identify contaminant migration onto the site.

No surface water or sediment samples were collected at Site 7 because there are no surface water bodies in the vicinity of the site. The Floral Drive stream is near Site 7, but was not sampled as part of the Site 7 investigation.

In addition to this RFI, a Field Investigation Report was prepared to assess the presence of explosives compounds as a result of past laboratory are field operations at NSWC-White Oak (TtNUS 2000).

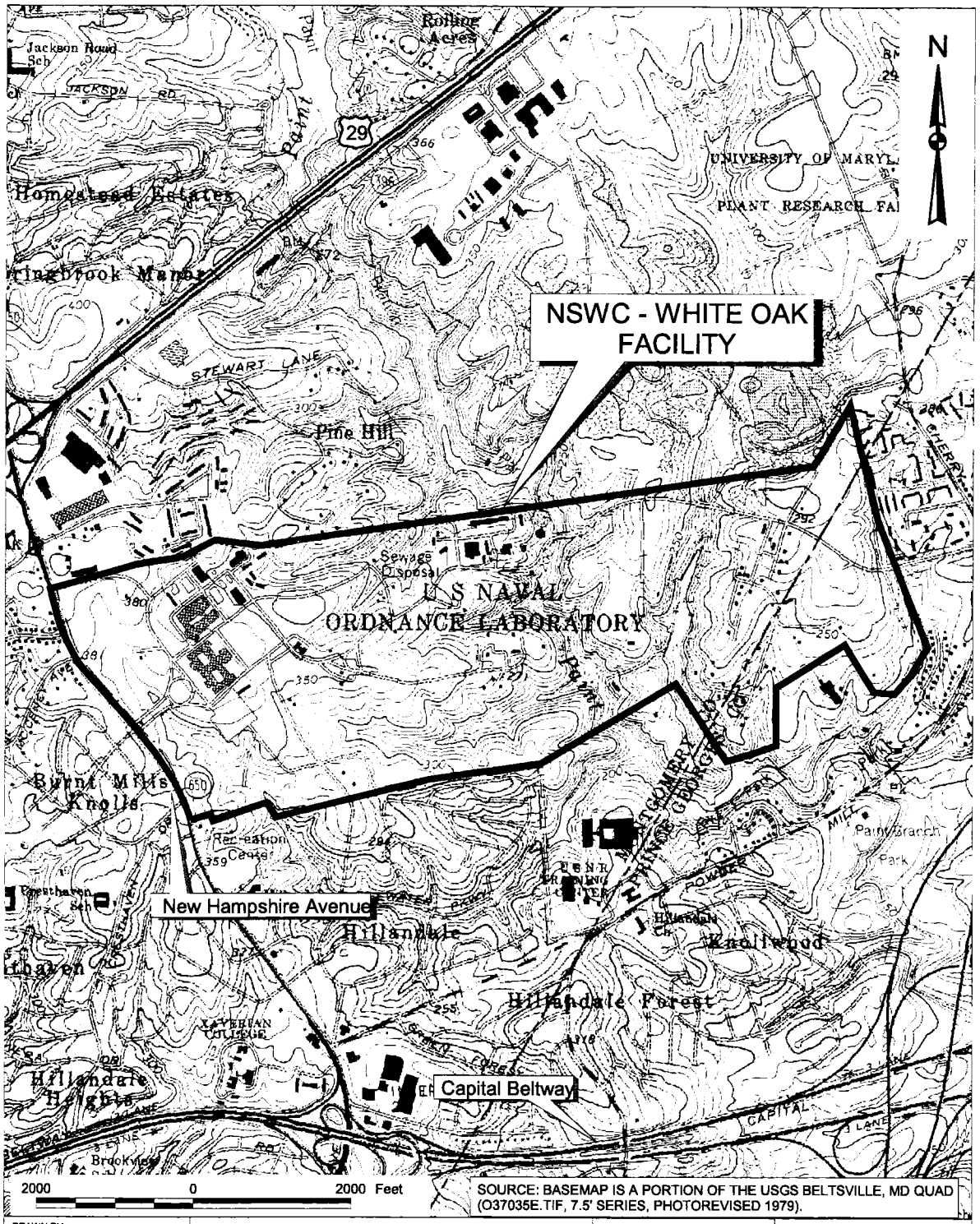
1.2.2.10 Remedial Investigation of Operable Unit 1

A RI for Operable Unit (OU) 1 was issued (CH2M HILL, 2002) for the combined areas associated with OU1. Groundwater was sampled during three events (identified in the RI as Rounds 5, 6, and 8) from wells within the Site 7 area. A geophysical survey was also performed to the north of Site 7.

Additional studies have been conducted at NSWC-White Oak to support the investigations at other sites and as facility-wide evaluations. Detailed discussion of previous investigations at the former NSWC-White Oak as well as Site 7 can be found in the references.

1.3 REPORT FORMAT

Section 1.0 of this report contains this introduction and site history. Section 2.0 presents the removal action objectives and discussions of the verification sampling activities performed at each site. An evaluation of the post-excavation soil concentrations and the risk from any remaining contaminants are presented and discussed in Section 3.0.



SOURCE: BASEMAP IS A PORTION OF THE USGS BELTSVILLE, MD QUAD (O37035E.TIF, 7.5' SERIES, PHOTOREVISED 1979).

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CHECKED BY DATE	SITE VICINITY MAP FORMER NSWC - WHITE OAK SILVER SPRING, MARYLAND	APPROVED BY — SN	DATE 2/14
COST/SCHEDULE-AREA		APPROVED BY —	DATE —
SCALE AS NOTED		DRAWING No. FIGURE 1-1	REV 0

P:\GIS\WHITEOAK\76470501.APR 10/23/00 SMT FIGURE 2-1 LAYOUT

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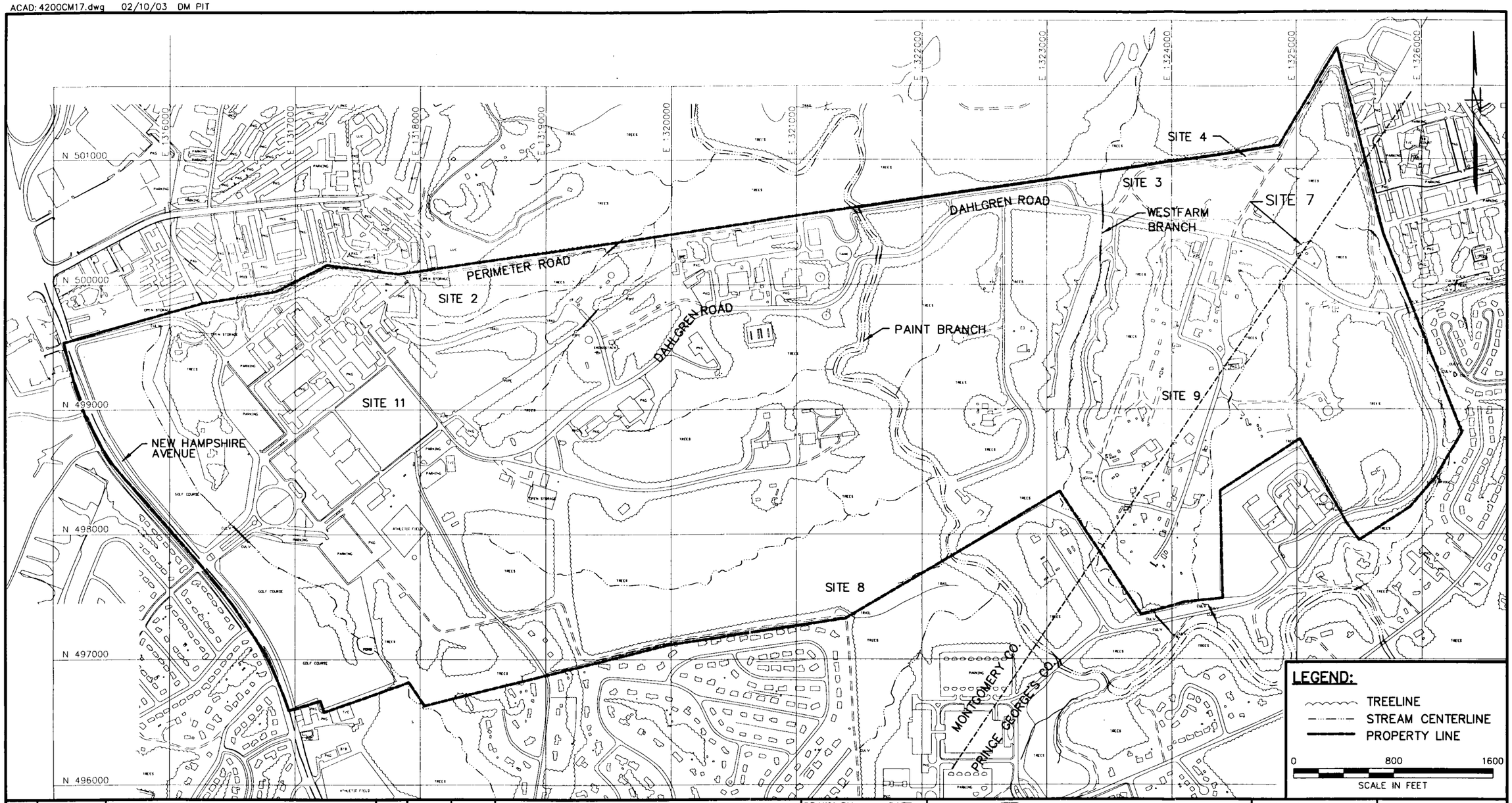

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DM DATE 2/10/03
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

SITE LOCATION MAP
SITE 7 PRAR
FORMER NSWC-WHITE OAK
SILVER SPRING, MARYLAND

CONTRACT NO. 4246
OWNER NO. 0839
APPROVED BY SN
DATE 2/14/03
APPROVED BY
DATE
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REV. 0

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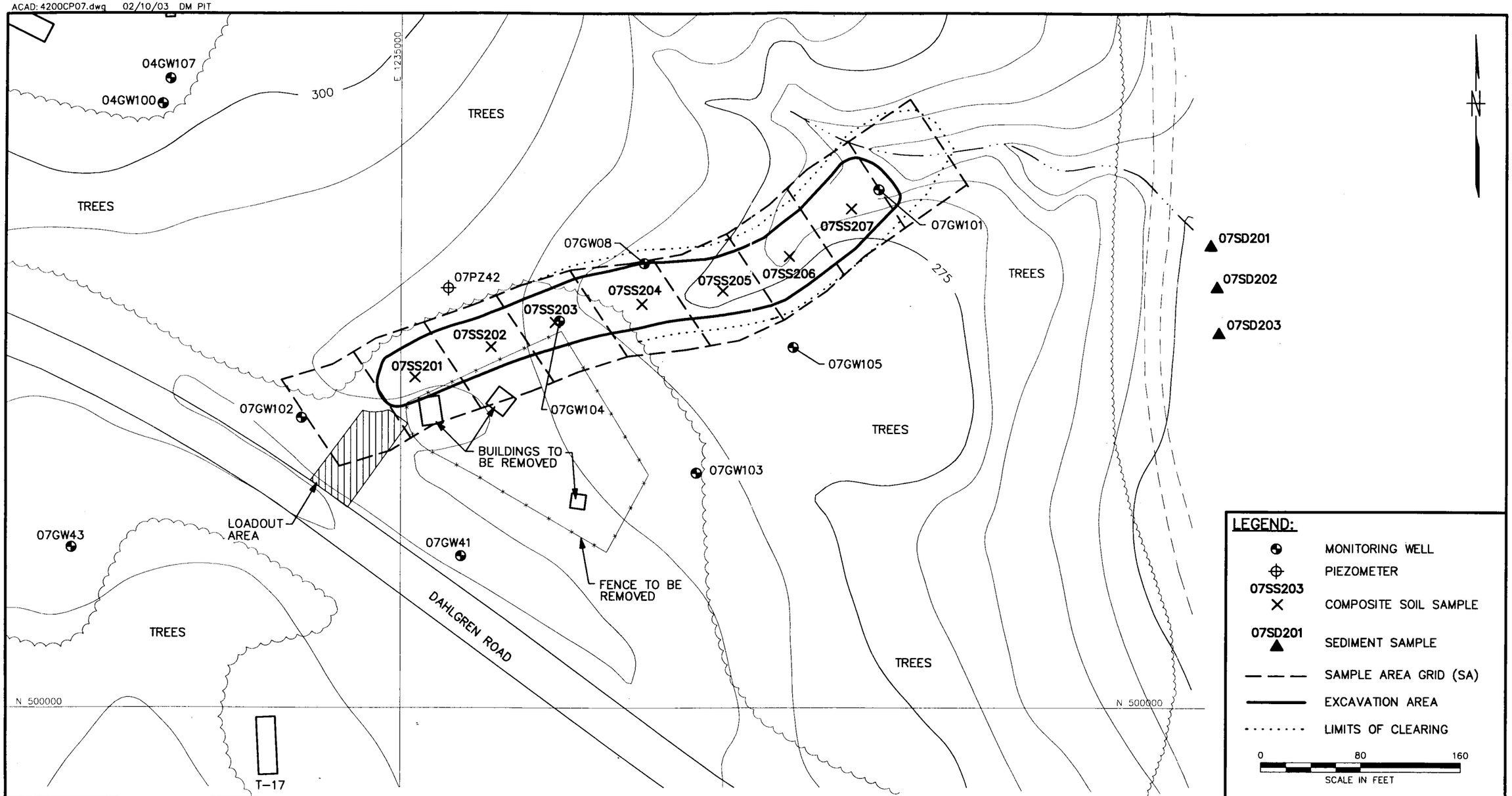

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY DM DATE 2/10/03
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COST/SCHED-AREA
SCALE AS NOTED

Tetra Tech NUS, Inc.

VERIFICATION SAMPLING LOCATIONS
SITE 7 REMOVAL ACTION
FORMER NSWC – WHITE OAK
SILVER SPRING, MARYLAND

CONTRACT NO. 4200
OWNER NO. 0836
APPROVED BY SN
DATE 2/14/03
APPROVED BY
DATE
DRAWING NO. FIGURE 1-3
REV. 0

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2.0 SUMMARY OF REMOVAL ACTION

2.1 REMOVAL ACTION OBJECTIVES

The Action Memorandum identified objectives for the time-critical removal action at Site 7 to mitigate risk related to the contaminated soil at the site. The time-critical removal action objectives for Site 7 address soil that was present and served to:

- Prevent direct contact with contaminated soil
- Reduce the erosion of contaminated soil
- Reduce or limit the site's potential to act as a source for groundwater contamination
- Minimize the human health risk to future land users
- Minimize risks to ecological receptors

EPA Region 3 residential RBCs were used to evaluate the sites. The residential RBCs were used in the site characterization and risk evaluation because they provide the basis for demonstrating whether the site is amenable to unrestricted use. Site 7 was transferred within the Federal government for commercial/industrial use for the foreseeable future. In addition, the basewide risk-based levels that were developed for the ecological COPCs in the Basewide Ecological Risk Assessment (BERA) (TtNUS, 2001a) were also used to evaluate the limits of contamination.

Site-specific Preliminary Remediation Goals (PRGs) were identified prior to removal action implementation, using a combination of EPA Region 3 residential RBCs and base-wide ecological risk-based levels. PRGs are chemical-specific concentration goals that dictate clean-up standards that must be met by a remedial action in order to be protective of human health and the environment.

Alternatives were evaluated for Site 7 based on effectiveness, implementability, and cost considerations. The recommended action for the site included excavation and off-site disposal of contaminated soil.

2.2 REMOVAL ACTION IMPLEMENTATION

The Naval Facilities Engineering Command Atlantic Division RAC began the removal action in August 2002 and completed it in December 2002. Excavation of contaminated soil was completed in November 2002, and off-site disposal and site restoration were completed in December 2002. Approximately 2,000 tons of soil were excavated and disposed off site.

2.3 VERIFICATION SAMPLING AND ANALYSIS

2.3.1 Analytical Parameters

Based on historic sampling data and the recommendations of the BCT, verification soil samples from Site 7 were analyzed for SW846 Method 8330 explosives.

2.3.2 Preliminary Data Screening

During the excavation of contaminated soil, verification sampling was performed. The sampling was performed in accordance with the Verification Sampling and Analysis Plan (VSAP) approved by the Base Realignment and Closure (BRAC) Clean-up Team (BCT). Following data collection, the sampling results were compared to the PRGs and EPA Region 3 RBCs to determine if the excavation activities were sufficiently complete. The sampling results are presented on Table 2-1.

2.3.3 Sample Collection

The frequency of the collection of verification samples at each site was established in the VSAP (TtNUS, 2002). Each collected sample was assigned a unique tracking number. This alphanumeric code identified the site, sample medium (SS – surface soil), and sample number.

At Site 7, eight samples were collected from seven locations during the course of the removal action. Refer to Figure 1-3 for their approximate location. At all sampling locations, the samples were analyzed for SW846 Method 8330 explosives. Analytical data for the soil samples collected at Site 7 are summarized in Table 2-1. Sample log sheets are provided in Appendix B. Data validation letters and the complete data set are provided in Appendix C.

2.3.4 Sediment Sample Collection

In addition, three sediment samples were collected from the unnamed tributary east of Site 7 to determine if contaminants had migrated downstream. These samples were also analyzed for SW846 Method 8330 explosives. The sampling locations are provided on Figure 1-3. The results are provided in Table 2-1.

2.4 SITE RESTORATION

Following completion of excavation and verification sampling, the site was restored by the Navy's Remedial Action Contractor (RAC). Restoration included soil backfill and seeding. In addition to soil backfill, a layer of organic mulch, mixed with sandy backfill and amended with vegetable oil, were placed at the bottom of the excavation created by the removal action. This layer will act as a carbon source that

will leach organic carbon into the infiltrating groundwater, and subsequently the underlying soil pore water and groundwater. This material will enhance the in-situ remediation of groundwater contaminated with explosives at the site. It is possible, and hoped that the leaching of the organic carbon may be sufficient enough to initiate the remediation of the aquifer.

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TABLE 2-1

VERIFICATION SAMPLING DATA
SITE 7 SOIL AND SEDIMENT
NSWC WHITE OAK
SILVER SPRING, MARYLAND
PAGE 1 OF 2

	07SS201	07SS202	07SS203	07SS204	07SS204D	07SS205	07SS206	07SS207
Explosives	**10/15/2002**	**10/15/2002**	**10/15/2002**	**10/15/2002**	**10/15/2002**	**11/7/2002**	**11/21/2002**	**11/21/2002**
HMX	0.53 U	0.52 U	0.52 U	4.2 J	9.7 J	0.5 U	0.59 U	4.7
RDX	0.53 U	0.52 U	0.52 U	2.1	1.3	0.5 U	0.59 U	0.59 U
1,3,5-Trinitrobenzene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
1,3-Dinitrobenzene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
Tetryl	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
Nitrobenzene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
2,4,6-Trinitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
4-amino-2,6-Dinitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	1.3
2-amino-2,6-Dinitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	2.2
2,6-Dinitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
2,4-Dinitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
2-Nitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
4-Nitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U
3-Nitrotoluene	0.53 U	0.52 U	0.52 U	0.55 U	0.54 U	0.5 U	0.59 U	0.59 U

All results reported in mg/Kg.
U - The analyte was not detected at the reporting limit shown.
J - Estimated value.

TABLE 2-1

VERIFICATION SAMPLING DATA
SITE 7 SOIL AND SEDIMENT
NSWC WHITE OAK
SILVER SPRING, MARYLAND
PAGE 2 OF 2

	07SD201	07SD202	07SD203
Explosives	10/15/2002	10/15/2002	10/15/2002
HMX	0.68 U	0.57 U	0.6 U
RDX	0.68 U	0.57 U	0.6 U
1,3,5-Trinitrobenzene	0.68 U	0.57 U	0.6 U
1,3-Dinitrobenzene	0.68 U	0.57 U	0.6 U
Tetryl	0.68 U	0.57 U	0.6 U
Nitrobenzene	0.68 U	0.57 U	0.6 U
2,4,6-Trinitrotoluene	0.68 U	0.57 U	0.6 U
4-amino-2,6-Dinitrotoluene	0.68 U	0.57 U	0.6 U
2-amino-2,6-Dinitrotoluene	0.68 U	0.57 U	0.6 U
2,6-Dinitrotoluene	0.68 U	0.57 U	0.6 U
2,4-Dinitrotoluene	0.68 U	0.57 U	0.6 U
2-Nitrotoluene	0.68 U	0.57 U	0.6 U
4-Nitrotoluene	0.68 U	0.57 U	0.6 U
3-Nitrotoluene	0.68 U	0.57 U	0.6 U

All results reported in mg/Kg.
U - The analyte was not detected at the reporting limit shown.
J - Estimated value.

3.0 POST-REMOVAL RISK ANALYSIS

3.1 HUMAN HEALTH RISK ASSESSMENT

This section presents the results of the human health risk assessment (HHRA) for post-removal surface soil at Site 7. The risk assessment is an addendum to the risk assessment for Site 7 reported in the RCRA Facility Investigation (RFI) for Sites 2, 3, 4, 7, 8, 9, and Paint Branch (TtNUS, Inc, October 2000b) and follows the methodologies presented in Section 2 of the RFI. In this evaluation, potential risks from exposure to explosives in post-removal soil at Site 7 are quantified for the same exposure pathways and receptors as the RFI. The risk assessment focuses on explosives because these compounds, primarily RDX, were identified as risk drivers for Site 7 in the RFI (TtNUS, Inc, October 2000b). The post-removal data used in this assessment represent soil left in place after removal actions at the site and replaces the surface soil data set used in the RFI.

The HHRA for Site 7 consists of the five components used in the risk assessment process. These include: (1) Data Evaluation; (2) Exposure Assessment; (3) Toxicity Assessment; (4) Risk Characterization, and (5) Uncertainty Analysis. Sections 3.1.1 of the RFI (TtNUS, Inc., October 2000) contains detailed discussions of the general methodologies followed for each component of the HHRA and Section 8.5 of the RFI (TtNUS, Inc., October 2000b) discusses these components as they apply to Site 7. The following sections discuss these components as they apply to this addendum.

3.1.1 Data Evaluation

The data evaluation section is primarily concerned with the selection of potential contaminants of concern (PCOCs) that are representative of the type and magnitude of potential human health effects. The PCOC screening process involves the comparison of maximum site concentrations to risk-based screening levels and other health-based standards. A brief discussion of data usability is also provided in the following section.

This section addresses the usability of the post-excavation soil data for risk assessment purposes. Validated post-excavation surface soil data collected in October and November 2002 by Tetra Tech NUS, Inc. were used to evaluate risks for Site 7. A total of 8 samples were collected from 7 locations (a duplicate sample was collected at one location) at Site 7 to verify the removal of contaminated soil. The samples (07SS201 through 07SS207) were composite samples collected across the limits of the excavation. No explosive compounds were detected at five of the seven sampling locations. HMX, RDX, 2-amino-4,6-dinitrotoluene, and/or 4-amino-4,6-dinitrotoluene were detected in two samples. However,

all detected concentrations were less than USEPA Region 3 residential RBCs. The list of samples used in this evaluation are presented in Table 3-1 and the validated analytical data are provided in Appendix C.

All analytical data used in the quantitative estimation of potential risks were subjected to data validation. Only data of adequate quality were used in the risk evaluation. A discussion of data validation protocol followed for data generated for the NSWC-White Oak is provided in the Master Quality Assurance Project Plan QAPP (B&R Environmental, 1998). Analytical data qualified as estimated and data qualified for blank contamination (considered as non-detects) were used in the risk assessment. When determining exposure concentrations via statistical procedures, chemicals qualified as estimated or having blank contamination were conservatively assumed to be present at a concentration equal to one-half the sample-specific quantitation limit.

The selection of PCOCs is a qualitative screening process with the purpose of limiting the number of chemicals to those site-related constituents that dominate overall potential risks. In this evaluation, a chemical is selected as a PCOC if the maximum detected concentration exceeds the PCOC screening level. The PCOC screening levels are based on USEPA Region III Risk-Based Concentrations (RBCs) for residential land use (USEPA, Region 3, October 2002) and correspond to a systemic hazard quotient of 0.1 for noncarcinogenic health effects or a lifetime cancer risk of 1E-6 for carcinogenic effects. Chemicals eliminated from further evaluation at this step are assumed to present minimal risks to potential human receptors.

The list of PCOCs developed for soil at Site 7 is based on the soil data set described above. A summary of the PCOC selection process for exposure to soil under residential land use is presented in Table 3-1. As stated previously, PCOCs for soil are those chemicals with maximum concentrations greater than screening levels based on USEPA Region III RBCs for residential soil ingestion.

The following chemicals were retained as PCOCs for soil:

- 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene

Although these two compounds were the only constituents identified as PCOCs, the other explosives positively detected in post-removal soil at Site 7, HMX and RDX, are also quantitatively evaluated in the risk assessment. HMX and RDX are also evaluated because these explosives were identified as PCOCs (and RDX was the primary risk driver) in the RFI (TtNUS, Inc, October 2000).

3.1.2 Exposure Assessment

A human health exposure assessment defines and evaluates, quantitatively or qualitatively, the type or magnitude of human exposure to PCOCs identified in environmental media at a site under investigation. The exposure assessment for this addendum employs the methodologies described in Sections 2.8.2 and 8.5.2 of the RFI (TtNUS, Inc, October 2000). As identified in Section 2.8.2, the potential human receptors evaluated at Site 7 include: full time workers, maintenance/utility workers, construction workers, adult recreational users, adolescent trespassers, day care center children, and child and adult residents. Pathway-specific information for these receptors, such as the values of exposure parameters used to quantify exposure, are presented in Tables 3-2 and 3-3. The values of the exposure parameters presented in these tables are identical to the values employed in the RFI with the exception of several factors associated with dermal exposure (i.e., soil-to-skin adherence factors, dermal absorption factors, and skin surface areas). The values of these factors have been updated to reflect recent USEPA guidance provided in Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance, Dermal Risk Assessment) (USEPA, September 2001).

The exposure point concentration (EPC) is a reasonable maximum estimate of the chemical concentration that is likely to be contacted over time and is used to calculate estimated exposure intakes. The 95 percent upper confidence limit (UCL), which is based on the distribution of a data set, is typically considered to be the best estimate of the exposure concentration for data sets with 10 or more samples. However, because the dataset for the PCOCs in post-removal soil at Site 7 consists of less than 10 samples, the maximum concentrations are used as the EPCs in this evaluation. The EPCs for the chemicals identified as PCOCs in surface soil at Site 7 are presented in RAGS-Part D Table 3.1 in Appendix D.

3.1.3 Toxicity Assessment

The toxicity assessment for Former NSWC, White Oak is presented in Section 2.8.3 of the RFI (TtNUS, Inc, October 2000). The toxicity information used in this risk assessment have been updated to reflect recent USEPA guidance and changes in toxicity values (CSFs and RfDs) as given in IRIS and the Region 3 RBC tables (USEPA, October 2002). The oral/dermal CSFs and RfDs used in risk assessment calculations are presented in Tables 3-4 and 3-5, respectively.

3.1.4 Risk Characterization

This section provides the methodologies and results for the characterization of the potential human health risks associated with the potential exposure to post-removal soil at Site 7.

Quantitative estimates of risk are calculated using intake and toxicity values according to risk assessment methods outlined in current USEPA guidance (USEPA, 1989). Lifetime cancer risks are expressed in the form of dimensionless probabilities, referred to as Incremental Lifetime Cancer Risks (ILCRs) which are derived using published cancer slope factors (CSFs). Noncarcinogenic risk estimates are presented in the form of Hazard Quotients (HQs) that are derived using published reference doses (RfDs).

ILCR estimates are generated for each PCOC using estimated exposure intakes and published CSFs, as follows:

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

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

Noncarcinogenic risks are assessed using the concept of HQs and Hazard Indices (HIs). The HQ for a PCOC is the ratio of the estimated intake to the RfD, as follows:

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

An HI is generated by summing the individual HQs for all of the PCOCs. It should be noted that HI is not a mathematical prediction of the severity of toxic effects and therefore is not a true "risk"; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

The calculations of the ILCRs and HQs for all receptors and exposure routes are provided in the RAGS Part D tables presented in Appendix D (Tables 7.1 through 7.8 present risk assessment calculations of the HQs and Tables 8.1 through 8.8 present the calculations of the ILCRs). Results of the risk characterization for Site 7 are discussed in Section 3.1.4.2.

3.1.4.1 Comparison of Quantitative Risk Estimates to Benchmarks

In order to interpret the quantitative risks and to aid risk managers in determining the need for remediation at a site, quantitative risk estimates are compared to typical benchmarks. The USEPA has defined the range of 1×10^{-6} to 1×10^{-4} as the ILCR "target range" for most hazardous waste facilities addressed under CERCLA. Cumulative ILCRs greater than 1×10^{-4} generally will indicate that some degree of remediation is required, while ILCRs below 1×10^{-6} normally will not result in remedial efforts. Whenever ILCRs fall between 1×10^{-4} and 1×10^{-6}, decisions for remediation will be made on a case-

specific basis. Individual chemicals contributing significantly to risks above the target range are considered to be chemicals of concern.

An HI exceeding unity (1.0) indicates that there may be potential noncarcinogenic health risks associated with exposure. If an HI exceeds unity, target organ effects from individual PCOCs contributing to the risk are considered. Only those chemicals that impact the same target organ(s) or exhibit similar critical effect(s) will be regarded as truly additive. Thus, PCOCs contributing to an HI greater than 1.0 on the basis of a single target organ/effect are considered to be chemicals of concern.

3.1.4.2 Risk Characterization Results

This section summarizes the results of the risk characterization for post-removal conditions at Site 7. Potential risks for the reasonable maximum exposure (RME) for surface soil are summarized in Table 3-6 and risks for the central tendency exposure (CTE) are presented in Table 3-7. Chemical-specific risks and total risks are presented in Tables 9.1 through 9.8 in Appendix D. A discussion of the estimated noncarcinogenic and carcinogenic risks is provided in the remainder of this section.

Noncarcinogenic Risks

Estimated HIs from exposure to post-removal surface soil at Site 7 are presented in Tables 3-6 and 3-7 for the RME and CTE, respectively. The cumulative HIs (the sum of Hazard Quotients for each COPC) for all receptors are less than the USEPA target of unity (1) for noncarcinogenic health effects. Therefore, no adverse noncarcinogenic health effects are expected from exposure to post-removal soil at Site 7 under the RME and CTE exposure conditions specified in the RFI (TtNUS, Inc, October 2000) and in Appendix D of this report.

Carcinogenic Risks

Estimated cancer risks (ILCRs) from exposure to post-removal surface soil at Site 7 are presented in Tables 3-6 and 3-7 for the RME and CTE, respectively. ILCRs for all receptors are less than the USEPA's risk management range, $1x10^{-6}$ to $1x10^{-4}$. For example, the total ILCR for hypothetical future residents (adult + child) is $4.7\ x10^{-7}$(Table 4-6).

As indicated previously, cancer risks less than $1.0x10^{-6}$ are considered acceptable and generally do not require remediation, whereas risk management decisions are necessary if potential risks fall within the risk management range. Cumulative ILCRs greater than $1x10^{-4}$ generally indicate that some degree of remediation is required.

3.1.5 Uncertainty Analysis

General uncertainties associated with the risk assessment for Site 7 are discussed in Sections 2.8.5 and 8.5.4 of the RFI (TtNUS, Inc., October 2000). Uncertainties associated with the calculation of risk in this addendum are addressed in this section.

- Only potential risks from explosives were quantified in this risk assessment. The calculated risks presented in Tables 3-6 and 3-7 may be underestimated because other classes of chemicals were not considered. However, the removal action renders this underestimate to be a negligible contribution to uncertainty.

- Potential risks were based on the assumption that potential receptors were exposed to maximum detected concentrations. Thus assumption may result in an overestimate of the calculated risks.

- USEPA Soil Screening Levels (SSLs) for inhalation and the protection of groundwater have not been developed for explosives. Therefore, these indirect exposure pathways could not be evaluated by a comparison of site concentrations to USEPA or Region 3 SSLs. However, to evaluate the potential of explosives in soil to impact groundwater, removal action objectives identified in Section 2 were formulated to be protective of groundwater for chemicals identified as constituents of concern identified in that media. The remedial action objectives were developed to be protective of groundwater but will not serve to mitigate existing groundwater contamination. Modeling was performed to predict the impact of soil contamination on the underlying groundwater at Site 7, the results of which were used to establish the PRGs for the removal action. The modeling predicted that the use of RBC concentrations in soil for the explosive contaminants at Site 7 would be protective of groundwater at the site. The results of the model are provided in Appendix E. Remedies for impacts to groundwater will be outlined in the OU1 CMS.

As the verification sampling concentrations were less than the RBCs for all explosives compounds, the soil remaining on-site will be protective of groundwater.

3.1.6 Summary and Conclusions

A risk evaluation was performed for soil at Site 7, Former NWSC, White Oak. The data used for the soil evaluation represent post-removal conditions at the site. Potential receptors included full time workers, maintenance/utility workers, construction workers, adult recreational users, adolescent trespassers, day care center children, and hypothetical child and adult residents. The receptors were evaluated for exposure to soil by dermal contact and ingestion.

The list of PCOCs for soil includes 2-amino-4,6-dinitrotoluene, 4-amino-4,6-dinitrotoluene. Although RDX and HMX were not identified as PCOCS, these chemicals were included in the quantitative risk assessment because they were detected in post-removal soil samples and were identified as PCOCs in the RFI (TtNUS, Inc, October 2000)

Quantitative estimates of noncarcinogenic and carcinogenic risks were developed for the potential receptors.

Estimated HIs from exposure to post-removal soil at Site 7 are presented in Tables 3-6 and 3-7. The cumulative HIs (the sum of Hazard Quotients for each COPC) for all receptors were less than the USEPA target of unity (1) for noncarcinogenic health effects. Therefore, no adverse noncarcinogenic health effects are expected from exposure to post-removal soil at Site 7 under the exposure conditions specified for the RME and CTE scenarios. ILCRs for all receptors were less than the USEPA's risk management range, $1x10^{-6}$ to $1x10^{-4}$. As indicated previously, cancer risks less than $1.0x10^{-6}$ are considered acceptable and generally do not require remediation. Modeling was performed to predict the impact of post-removal soil contamination on the underlying groundwater at Site 7. The modeling predicted that the use of RBC concentrations in soil for the explosive contaminants at Site 7 would be protective of groundwater at the site. Since the verification sampling concentrations were less than the RBCs for all explosives compounds, the explosive concentrations remaining on-site soil are considered to be protective of groundwater.

3.2 ECOLOGICAL RISK EVALUATION

The BERA for NSWC-White Oak developed basewide soil and sediment risk-based levels for several chemicals (TtNUS, 2001a) for use in scoping remedial actions. The rationale for the selection of the soil and sediment constituents is presented in the BERA work plan (TtNUS, 2000a). The work plan also presents alternate benchmarks for screening the chemicals that were not carried through the BERA and for which a risk-based soil or sediment level was not established.

No PCOCs were identified for ecological risk in soil at Site 7 prior to the removal action. As concentrations of explosive contaminants were further reduced as a result of the removal action, no ecological risks are present at Site 7 following the removal action.

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TABLE 3-1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF POTENTIAL CONSTITUENTS OF CONCERN
POST-REMOVAL SURFACE SOIL - SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Entire Site

CAS Numb	Chemical	Minimum Concentration	Minimum Qualifier	Maximum Concentratio n	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Nondetects (1)	Concentration Used for Screening(2)	Background Value	Risk-Based Residential PCOC Screening Level(3)		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	PCOC Flag	Rationale for Contaminant Deletion or Selection(4)
Explosives (mg/kg)																	
35572-78-2	2-Amino-4,6-dinitrotoluene	2.2		2.2		mg/kg	07SS007	1/7	0.52 - 0.68	2.2	NA	0.47	N	NA	SSL_MIGR SSL_INH	Yes	ASL
19406-51-0	4-Amino-2,6-dinitrotoluene	1.3		1.3		mg/kg	07SS007	1/7	0.52 - 0.68	1.3	NA	0.47	N	NA	SSL_MIGR SSL_INH	Yes	ASL
2691-41-0	HMX	4.7	J	9.7	J	mg/kg	07SS204D	2/7	0.52 - 0.68	9.7	NA	390	N	NA	SSL_MIGR SSL_INH	No	BSL
121-82-4	RDX	2.1	J	2.1	J	mg/kg	07SS204	1/7	0.52 - 0.68	2.1	NA	5.8	C	NA	SSL_MIGR SSL_INH	No	BSL

Shaded cells indicate that the maximum concentration exceeds the specified criterion or constituent has been selected as a PCOC.

Footnotes:

1 Values presented are sample-specific quantitation limits.
2 The maximum detected concentration is used for screening purposes.
3 The risk-based soil COPC screening level for residential land use is presented. The value is based on a target hazard quotient of 0.1 for noncarcinogens (denoted with a "N" flag) or an incremental cancer risk of 1E-6 for carcinogens (denoted with a "C" flag) (USEPA, Region III, October 2002).
4 The chemical is selected as a PCOC if the maximum detected concentration exceeds the risk-based PCOC screening level and facility-wide background levels.

Associated Samples:

07SS201	07SS204D
07SS202	07SS205
07SS203	07SS206
07SS204	07SS207

Rationale Codes:
For Selection as a PCOC:
ASL = Above PCOC Screening Level

For Elimination as a PCOC:
BSL = Below PCOC Screening Level

Definitions
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogen
J = Estimated Value
N = Noncarcinogen
NA = Not Applicable/Not Available.
PCOC = Potential Constituent of Concern
SSL-INH = Soil Screening Level for transfers from soil to air (Inhalation) (USEPA, May 1996)
SSL-MIGR = Soil Screening Level for transfers from soil to groundwater for a Dilution and Attenuation Factor of 20 (USEPA, Region 3, April 2002)

TABLE 3-2

SUMMARY OF EXPOSURE FACTORS - REASONABLE MAXIMUM EXPOSURE
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Exposure Route	Full Time Worker	Maintenance/ Utility Worker	Construction Worker	Adult Recreational User	Adolescent Trespasser	Day Care Center Child	Future Adult Resident	Future Child Resident
Exposure Concentration - C_{soil} (mg/kg)	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]
Exposure Frequency (EF) (days/year)	250[1]	36[2]	180[2]	16[2]	52[2]	250[1]	350[1]	350[1]
Exposure Duration (ED) (years)	25[1]	25[1]	1[2]	30[1]	10[3]	6[1]	24[1]	6[1]
Body Weight (BW) (kg)	70[4]	70[4]	70[4]	70[4]	43[5]	15[4]	70[4]	15[4]
Noncarcinogenic Averaging Time (AT_n) (days)	9,125[4]	9,125[4]	365[4]	10,950[4]	3,650[4]	2,190[4]	8,760[4]	2,190[4]
Carcinogenic Averaging Time (AT_c) (days)	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]
Ingestion Rate (IR) (mg/day)	100[1]	100[1]	480[1]	100[1]	100[1]	200[1]	100[1]	200[1]
Fraction Ingested from Contaminated Source (Fi) (unitless)	1.0[6]	1.0[6]	1.0[6]	1.0[6]	1.0[6]	0.5[6]	1.0[6]	1.0[6]
Skin Surface Area (SA) (cm^2/day)	3,300[6]	3,300[6]	3,300[6]	9,000[5]	3,263[5]	2,800[6]	5,700[6]	2,800[6]
Soil-to-Skin Adherence Factor (AF) (mg/cm^2)	0.2[6]	0.2[6]	0.3[6]	0.08[6]	0.3[6]	0.2[6]	0.07[6]	0.2[6]
Absorption Factor (ABS) (unitless)	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]
Conversion Factor (CF) (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06

1. USEPA, May 1993
2. Professional Judgement
3. Adolescent, 7 -16 years of age
4. USEPA, December 1989
5. USEPA, August 1997
6. USEPA, September 2001

TABLE 3-3

SUMMARY OF EXPOSURE FACTORS - CENTRAL TENDENCY EXPOSURE
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Exposure Route	Full Time Worker	Maintenance/ Utility Worker	Construction Worker	Adult Recreational User	Adolescent Trespasser	Day Care Center Child	Future Adult Resident	Future Child Resident
Exposure Concentration - C_{soil} (mg/kg)	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]	Maximum or 95% UCL[1]
Exposure Frequency (EF) (days/year)	219[1]	18[2]	180[2]	8[2]	26[2]	219[1]	234[1]	234[1]
Exposure Duration (ED) (years)	9[1]	9[1]	1[2]	9[1]	10[3]	3[2]	7[1]	2[1]
Body Weight (BW) (kg)	70[4]	70[4]	70[4]	70[4]	43[5]	15[4]	70[4]	15[4]
Noncarcinogenic Averaging Time (AT_n) (days)	3,285[4]	3,285[4]	365[4]	3,285[4]	3,650[4]	1,095[4]	2,555[4]	730[4]
Carcinogenic Averaging Time (AT_c) (days)	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]	25,550[4]
Ingestion Rate (IR) (mg/day)	50[1]	50[1]	240[1]	50[1]	50[1]	100[1]	50[1]	100[1]
Fraction Ingested from Contaminated Source (Fi) (unitless)	1.0[6]	1.0[6]	1.0[6]	1.0[6]	1.0[6]	0.5[6]	1.0[6]	1.0[6]
Skin Surface Area (SA) (cm^2/day)	3,300[6]	3,300[6]	3,300[6]	9,000[5]	3,263[5]	2,800[6]	5,700[6]	2,800[6]
Soil-to-Skin Adherence Factor (AF) (mg/cm^2)	0.02[6]	0.02[6]	0.1[6]	0.01[6]	0.04[6]	0.04[6]	0.01[6]	0.04[6]
Absorption Factor (ABS) (unitless)	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]	chemical-specific[6]
Conversion Factor (CF) (kg/mg)	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06	1E-06

1. USEPA, May 1993
2. Professional Judgement
3. Adolescent, 7 -16 years of age
4. USEPA, December 1989
5. USEPA, August 1997
6. USEPA, September 2001

TABLE 3-4

CANCER TOXICITY DATA -- ORAL/DERMAL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Chemical of Potential Concern	Oral CSF	Oral to Dermal Adjustment Factor[1]	Adjusted Dermal Cancer Slope Factor[2]	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
RDX	1.1E-01	1	1.10E-01	$(mg/kg\text{-}day)^{-1}$	C	IRIS	2/14/2003

1 USEPA, September 2001.
2 CSFdermal = CSForal/(Oral to Dermal Adjustment Factor)

Notes:
CSF = Cancer Slope Factor
IRIS = Integrated Risk Information System, on-line database search (USEPA, February 2

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

TABLE 3-5

NON-CANCER TOXICITY DATA FOR CHEMICALS OF CONCERN -- ORAL/DERMAL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD	Oral RfD Units	Oral to Dermal Adjustment Factor(1)	Adjusted Dermal RfD(2)	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ
2-Amino-4,6-dinitrotoluene	chronic	6.0E-05	mg/kg-day	1	6.00E-05	mg/kg-day	Liver	NA	NCEA	10/09/02
4-Amino-2,6-dinitrotoluene	chronic	6.0E-05	mg/kg-day	1	6.00E-05	mg/kg-day	Liver	NA	NCEA	10/09/02
HMX	chronic	5.2E-02	mg/kg-day	1	5.20E-02	mg/kg-day	Liver, Blood	1,000	IRIS	02/14/03
RDX	chronic	3.0E-03	mg/kg-day	1	3.00E-03	mg/kg-day	Prostate	100	IRIS	02/14/03

1 USEPA, September 2001 .

2 RfD dermal = RfDoral x (Oral to Dermal Adjustment Factor)

Notes: RfD = Reference dose
IRIS = Integrated Risk Information System, on-line database search (USEPA, February 2003)
NCEA = USEPA National Center for Environmental Assessment (USEPA RBC Table, October; 2002)
NA = Not applicable/Not Available

TABLE 3-6

CUMULATIVE RISK SUMMARY - REASONABLE MAXIMUM EXPOSURE TO POST-REMOVAL SOIL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Exposure Route	Full Time Worker	Maintenance/Utility Worker	Construction Worker	Adult Recreational User	Adolescent Trespasser	Day Care Center Child	Future Adult Resident	Future Child Resident
HAZARD INDEX								
Incidental Ingestion of Surface Soil	0.06	0.02	0.20	0.004	0.02	0.27	0.08	0.76
Dermal Contact with Surface Soil	0.04	0.02	0.04	0.003	0.02	0.23	0.03	0.21
Total Hazard Index	**0.10**	**0.04**	**0.24**	**0.006**	**0.04**	**0.50**	**0.11**	**0.97**
INCREMENTAL CANCER RISK								
Incidental Ingestion of Surface Soil	8.1E-08	1.1E-08	1.1E-08	6.2E-09	1.1E-08	9.0E-08	1.1E-07	2.5E-07
Dermal Contact with Surface Soil	5.3E-08	1.1E-08	2.3E-09	4.5E-09	1.1E-08	7.6E-08	4.3E-08	7.1E-08
Total Cancer Risk	**1.3E-07**	**2.2E-08**	**1.3E-08**	**1.1E-08**	**2.2E-08**	**1.7E-07**	**1.5E-07**	**3.2E-07**

TABLE 3-7

CUMULATIVE RISK SUMMARY - CENTRAL TENDENCY EXPOSURE TO POST-REMOVAL SOIL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Exposure Route	Full Time Worker	Maintenance/Utility Worker	Construction Worker	Adult Recreational User	Adolescent Trespasser	Day Care Center Child	Future Adult Resident	Future Child Resident
HAZARD INDEX								
Incidental Ingestion of Surface Soil	0.025	0.005	0.10	0.001	0.005	0.12	0.027	0.25
Dermal Contact with Surface Soil	0.003	0.001	0.014	0.0002	0.001	0.03	0.003	0.03
Total Hazard Index	**0.03**	**0.006**	**0.11**	**0.001**	**0.006**	**0.14**	**0.03**	**0.28**
INCREMENTAL CANCER RISK								
Incidental Ingestion of Surface Soil	1.3E-08	2.7E-09	5.6E-09	4.6E-10	2.7E-09	2.0E-08	1.1E-08	2.8E-08
Dermal Contact with Surface Soil	1.7E-09	7.1E-10	7.7E-10	8.4E-11	7.1E-10	4.4E-09	1.2E-09	3.2E-09
Total Cancer Risk	**1.4E-08**	**3.4E-09**	**6.3E-09**	**5.5E-10**	**3.4E-09**	**2.4E-08**	**1.2E-08**	**3.1E-08**

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APPENDIX A

HISTORICAL ANALYTICAL DATA

TABLE A-1

RFI - SURFACE SOIL SUMMARY STATISTICS
SITE 7 - ORDNANCE BURN AREA
NSWC- WHITE OAK, SILVER SPRING MARYLAND

Analyte	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Location of Maximum Concentration
INORGANICS				
Aluminum	6/7	3190	8870	7SS1050100
Antimony	1/7	0.57 K	0.57 K	7SS1060100
Arsenic	7/7	1.9 K	2.7 K	7SS1020100
Barium	7/7	12.4	474	7SS1060100
Calcium	5/7	232	785	7SS1050100
Chromium	7/7	7.5	16.7	7SS1050100
Cobalt	6/7	1.9	9.9	7SS1050100
Copper	7/7	3.6	32.3	7SS1010100
Iron	7/7	4380	13000	7SS1050100
Lead	7/7	13.2	42.1	7SS1010100
Magnesium	7/7	264	1830	7SS1050100
Manganese	7/7	58.6 J	562	7SS1050100
Mercury	4/7	0.07	0.17	7SS1010100
Nickel	7/7	3.3	19.1	7SS1050100
Potassium	7/7	92.6	967	7SS1050100
Silver	1/7	2.4	2.4	7SS1010100
Vanadium	7/7	11.8	22.8	7SS1050100
Zinc	7/7	19.3 J	73.8 J	7SS1010100
SEMIVOLATILES				
Anthracene	2/7	0.056 J	0.066 J	7SS1020100
Benzo(a)anthracene	3/7	0.044 L	0.38	7SS1020300
Benzo(a)pyrene	3/7	0.043 L	0.35	7SS1020300
Benzo(b)fluoranthene	3/7	0.074 L	0.54	7SS1020300
Benzo(g,h,i)perylene	2/7	0.078 J	0.081 J	7SS1020100
Benzo(k)fluoranthene	2/7	0.19 J	0.22 J	7SS1020300
Chrysene	3/7	0.049 L	0.42	7SS1020300
Dibenzo(a,h)anthracene	2/7	0.036 J	0.047 J	7SS1020300
Fluoranthene	4/7	0.042 J	0.95	7SS1020300
Hexachloroethane	1/7	0.07 J	0.07 J	7SS1040100
Indeno(1,2,3-cd)pyrene	2/7	0.15 J	0.15 J	7SS1020100
Phenanthrene	3/7	0.068 L	0.48	7SS1020100
Pyrene	3/7	0.059 L	0.58	7SS1020300
Bap Equivalents	*3/7*	0.054849	0.50662	*7SS1020300*
VOLATILE				
Methylene Chloride	1/7	0.013	0.013	7SS1020300
PESTICIDE/PCBs				
4,4'-DDE	2/6	0.00037 J	0.00051 J	7SS1060100
4,4'-DDT	1/6	0.00049 J	0.00049 J	7SS1030100
Alpha-Chlordane	2/6	0.0019	0.0028 J	7SS1010100
Aroclor-1260	3/7	0.0075 J	0.38	7SS1050100
Dieldrin	2/6	0.00027 J	0.00029 J	7SS1060100
Gamma-Chlordane	1/7	0.00091 J	0.00091 J	7SS1030100
Heptachlor Epoxide	1/6	0.00082 J	0.00082 J	7SS1030100
Total PCBs	3/7	0.0075	0.38	7SS1050100
EXPLOSIVES				
2,4,6-Trinitrotoluene	2/7	0.039 J	7.1 J	7SS1010100
HMX	2/7	0.61	860	7SS1010100
Nitrobenzene (exp)	1/7	0.31	0.31	7SS1060100
RDX	2/7	0.83	42 J	7SS1010100
MISCELLANEOUS				
Chemical Oxygen Demand **ug/L**	1/1	120000	120000	7SS1030100
pH	1/1	4.8	4.8	7SS1030100
Total Organic Carbon **mg/kg**	1/1	6300	6300	7SS1030100

J = Estimated Value
K = Value Biased High
L = Value Biased Low

TABLE A-2

RFI - SUBSURFACE SOIL SUMMARY STATISTICS
SITE 7 - ORDNANCE BURN AREA
NSWC- WHITE OAK, SILVER SPRING MARYLAND

Analyte	Frequency of Detection	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Location of Maximum Concentration
ORGANICS				
Aluminum	6/6	783	9480	7SU1010200
Arsenic	6/6	0.61 K	4.4	7SU1010200
Barium	6/6	2.6	330	7SU1010200
Calcium	5/6	147 J	368	7SU1020200
Chromium	6/6	2.3	14.5	7SU1020200
Cobalt	5/6	1.2	4.4	7SU1060200
Copper	5/6	4.4	12.7	7SU1020200
Iron	6/6	1030	12000	7SU1020200
Lead	5/6	5.7	20.9	7SU1010200
Magnesium	5/6	238	788	7SU1010200
Manganese	6/6	7.5	782	7SU1060200
Nickel	5/6	2.3	7.3	7SU1050200
Potassium	5/6	129	426	7SU1010200
Selenium	1/6	3.2 J	3.2 J	7SU1020200
Vanadium	6/6	2.9	22.3	7SU1020200
Zinc	5/6	5.2 J	46.6 J	7SU1010200
SEMIVOLATILE				
Hexachloroethane	2/6	0.095 J	0.12 J	7SU1040200
VOLATILE				
Acetone	1/6	0.02 J	0.02 J	7SU1060200
Methylene Chloride	2/6	0.002 J	0.002 J	7SU1010200
PESTICIDES/PCBs				
Alpha-Chlordane	1/6	0.017	0.017	7SU1010200
Endosulfan I	1/6	0.0036	0.0036	7SU1010200
Gamma-Chlordane	1/6	0.018	0.018	7SU1010200
Methoxychlor	1/6	0.0023 J	0.0023 J	7SU1010200
EXPLOSIVES				
2,4,6-Trinitrotoluene	1/6	14	14	7SU1010200
2-Amino-4,6-dinitrotoluene	1/6	2.3 J	2.3 J	7SU1010200
2-Nitrotoluene	1/6	0.84 J	0.84 J	7SU1010200
4-Amino-2,6-dinitrotoluene	1/6	6.3	6.3	7SU1010200
HMX	1/6	44	44	7SU1010200
RDX	2/6	0.17 J	9.9	7SU1010200
Tetryl	1/6	0.77 J	0.77 J	7SU1010200
MISCELLANEOUS				
Total Organic Carbon **mg/kg**	1/1	290	290	7SU1030200
pH	1/1	5.4	5.4	7SU1030200

J = Estimated Value
K = Value Biased High

TABLE A-3

RFI - UNFILTERED GROUNDWATER
SUMMARY STATISTICS
SITE 7 - ORDNANCE BURN AREA
NSWC- WHITE OAK, SILVER SPRING MARYLAND

Analyte	Frequency of Detection	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Location of Maximum Concentration
Aluminum	4/9	220 K	1010 K	7GW1020001
Arsenic	2/9	1.9	2.8	7GW410001-D
Barium	9/9	18.6	63.8	7GW420001
Calcium	9/9	3410	16400	7GW410001-D
Chromium	6/9	4	59	7GW1020001-D
Cobalt	4/9	9	25	7GW1020001-D
Iron	8/9	460	3780 J	7GW1020001
Lead	1/9	3.1	3.1	7GW080001
Magnesium	9/9	2390	11400	7GW410001-D
Manganese	9/9	20.4	139	7GW430001
Mercury	5/9	0.55	5.5	7GW420001
Nickel	5/9	7.7	153	7GW080001
Potassium	4/9	1150	1500	7GW410001-D
Selenium	3/9	2.8 J	4.9 J	7GW410001
Sodium	9/9	3680	15800	7GW430001
Thallium	3/9	3.2	5.6	7GW1050001
Zinc	4/9	14.4	22.2	7GW1030001
SEMIVOLATILES				
2,6-Dinitrotoluene	1/9	1.3 J	1.3 J	7GW080001
Bis(2-Ethylhexyl)phthalate	2/9	1.1 J	1.1 J	7GW1050001
Di-n-butyl phthalate	1/9	1.1 J	1.9 J	7GW1020001-D
VOLATILES				
1,1,1-Trichloroethane	1/9	1.2	1.2	7GW410001
1,1,2,2-Tetrachloroethane	3/9	6.5	77	7GW410001
1,1,2-Trichloroethane	2/9	0.46 J	1.3	7GW410001
1,1-Dichloroethane	1/9	0.41 J	0.41 J	7GW410001
1,1-Dichloroethene	2/9	0.3 J	1.5	7GW430001
1,2-Dichloroethane	2/9	0.93 J	1.8	7GW410001
1,3 Dichlorobenzene	1/9	0.35 J	0.35 J	7GW410001
1,4 Dichlorobenzene	1/9	0.26 J	0.26 J	7GW410001
Chlorobenzene	1/9	0.42 J	0.42 J	7GW430001
Chloroform	6/9	0.32 J	1.8	7GW1040001
Tetrachloroethene	2/9	0.53 J	0.63 J	7GW410001
Toluene	1/9	0.41 J	0.41 J	7GW1040001
Trans-1,2-dichloroethene	2/9	0.34 J	0.46 J	7GW430001
Trichloroethene	4/9	1.6	370	7GW410001
Vinyl Chloride	2/9	0.36 J	1.6	7GW410001
Xylenes, Total	1/9	0.49 J	0.49 J	7GW1040001
cis-1,2-dichloroethene	3/9	21	43	7GW410001
PESTICIDES/PCBs				
Alpha-Chlordane	1/9	0.052 J	0.052 J	7GW1050001
gamma-BHC (Lindane)	1/9	0.058	0.058	7GW1010001
EXPLOSIVES				
1,3,5-Trinitrobenzene	1/9	2.3	2.3	7GW1030001
2,4,6-Trinitrotoluene	4/9	2.2	210	7GW080001
2-Amino-4,6-dinitrotoluene	4/9	1.4	62	7GW080001
4-Amino-2,6-dinitrotoluene	5/9	0.2	110	7GW080001
HMX	6/9	0.57	140	7GW1040001
RDX	6/9	1.4	510	7GW080001
MISCELLANEOUS				
Ammonium Perchlorate	6/9	5.19	28.4 L	7GW1030001

J = Estimated Value
K = Value Biased High
L = Value Biased Low

TABLE A-4

RFI - FILTERED GROUNDWATER
SUMMARY STATISTICS
SITE 7 - ORDNANCE BURN AREA
NSWC- WHITE OAK, SILVER SPRING MARYLAND

Analyte	Frequency of Detection	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Location of Maximum Concentration
ORGANICS				
Arsenic, Filtered	1/8	1.8	1.8	7GW1020001-F
Barium, Filtered	8/8	17.2	59.5 J	7GW1020001-F
Calcium, Filtered	8/8	3380	16300 J	7GW410001-F
Chromium, Filtered	1/8	3	3	7GW1020001-F-D
Cobalt, Filtered	3/8	8.7	22.2	7GW1030001-F
Iron, Filtered	3/8	431 J	1930 J	7GW1020001-F-D
Lead, Filtered	2/8	5.1	6.6	7GW080001-F
Magnesium, Filtered	8/8	2370	11600 J	7GW410001-F
Manganese, Filtered	8/8	20.8	152 J	7GW1020001-F
Mercury, Filtered	3/8	0.48	4.4	7GW420001-F
Nickel, Filtered	4/8	10.5	36.3	7GW080001-F
Potassium, Filtered	3/8	1340	2090	7GW1020001-F-D
Sodium, Filtered	8/8	3120	16300	7GW430001-F
Thallium, Filtered	4/8	3.1	4.2	7GW1030001-F
Zinc, Filtered	3/8	14.9 K	32.9 K	7GW430001-F

J = Estimated Value
K = Value Biased High

TABLE A-5

PHASE II REMEDIAL INVESTIGATION SOIL DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Counpound	Units	Detection Limit	Sample Location					
			7SB28A	7SB28B	7SB28C	7SB29A	7SB29B	7SB29C
2, 4, 6-TNT	mg/kg	0.47	**1.3**	BDL	BDL	BDL	BDL	BDL
RDX	mg/kg	0.18	**0.35**	**1.1**	BDL	BDL	BDL	BDL
HMX	mg/kg	0.27	BDL	**0.4**	**150**	BDL	BDL	BDL
2, 4-DNT	mg/kg	0.66	BDL	BDL	BDL	BDL	BDL	BDL
2, 6-DNT	mg/kg	0.36	BDL	BDL	BDL	BDL	BDL	BDL
1, 3, 5-TNB	mg/kg	0.53	BDL	BDL	BDL	BDL	BDL	BDL
1,3-DNB	mg/kg	0.2	BDL	BDL	BDL	BDL	BDL	BDL
NB	mg/kg	0.57	BDL	BDL	BDL	BDL	BDL	BDL
TETRYL	mg/kg	4	BDL	BDL	BDL	BDL	BDL	BDL

BDL Below Detection Limit
A Sample collected at depth of 5 feet
B Sample collected at depth of 10 feet
C Sample collected at depth of 15 feet

TABLE A-6

PHASE II REMEDIAL INVESTIGATION GROUNDWATER DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Counpound	Units	Detection Limit	Sample Location		
			7GW08	7GW41	7GW43
TOTAL METALS:					
Cadmium	ug/l	5	BDL	BDL	BDL
Chromium	ug/l	10	BDL	**12**	**5.2**
Copper	ug/l	25	**23**	**121**	**34**
Lead	ug/l	3	BDL	**3.8**	**3.8**
Mecury	ug/l	0.2	R	R	R
Zinc	ug/l	20	**312**	**34**	**10**
FILTERED METALS:					
Cadmium	ug/l	5	BDL	BDL	BDL
Chromium	ug/l	10	BDL	BDL	BDL
Copper	ug/l	25	**20**	**45**	**15**
Lead	ug/l	3	**3.8**	BDL	BDL
Mecury	ug/l	0.2	R	R	R
Zinc	ug/l	20	**15**	**5350**	**44**
NITROAROMATICS:					
2,4,6-TNT	ug/l	0.94	**1900**	BDL	BDL
RDX	ug/l	1.6	**2300**	BDL	BDL
HMX	ug/l	4.2	**470**	BDL	BDL
2,4-DNT	ug/l	0.5	**3.1**	BDL	BDL
2,6-DNT	ug/l	0.5	**3.2**	BDL	BDL
1, 3, 5-TNB	ug/l	0.2	**31.1**	BDL	**1.1**
1,3-DNB	ug/l	2.6	**10.3**	BDL	BDL
NB	ug/l	1.5	BDL	BDL	BDL
Tetryl	ug/l	3.7	BDL	**13.3**	BDL
VOCs:					
Methylene Chloride	ug/l	5	BDL	BDL	BDL
cis-1,2-Dichlororoethene	ug/l	5	BDL	**6**	BDL
Trichloroethene	ug/l	5	BDL	**33**	BDL
1,1,2,2-Tetrachloroethane	ug/l	5	BDL	**6**	BDL
Acetone	ug/l	10	BDL	BDL	**17 E**

BDL Below Detection Limit
R Quantitation Rejected
E Quantitation Estimated

TABLE A-7

PHASE I REMEDIAL INVESTIGATION SOIL DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Sample	Units	Detection Limit	Compounds					
			2, 4, 6-TNT	RDX	HMX	2, 4-DNT	2, 6-DNT	1, 3, 5-TNB
7SL03A	mg/kg	0.02	BDL	**8.3**	**30**	BDL	BDL	BDL
7SL03B	mg/kg	0.019	BDL	**1.1**	**0.36**	BDL	BDL	BDL
7SL06A	mg/kg	0.02	**0.21**	**0.27**	**1.5**	BDL	BDL	BDL
7SL06B	mg/kg	0.02	**0.91**	BDL	**0.71**	BDL	BDL	BDL
7SL11A	mg/kg	0.02	BDL	BDL	**3**	BDL	BDL	BDL
7SL11B	mg/kg	0.02	**0.45**	**0.28**	**0.52**	BDL	BDL	BDL
7SL12A	mg/kg	0.02	**0.23**	**1.3**	**74**	BDL	BDL	BDL
7SL12B	mg/kg	0.02	**0.45**	**0.47**	**51**	BDL	BDL	BDL
7SL13A	mg/kg	0.02	**0.21**	**1**	**6**	BDL	BDL	BDL
7SL13B	mg/kg	0.019	**0.38**	**0.85**	**5.8**	BDL	BDL	BDL
7SL15A	mg/kg	0.02	**0.33**	**0.74**	**1.3**	BDL	BDL	BDL
7SL15B	mg/kg	0.02	**0.41**	**0.38**	**0.98**	BDL	BDL	BDL
7SL16A	mg/kg	0.019	**0.12**	**1.3**	**51**	BDL	BDL	BDL
7SL16B	mg/kg	0.19	**0.13**	**0.93**	**17**	BDL	BDL	BDL
7SL17A	mg/kg	0.02	BDL	**0.22**	**13**	BDL	BDL	BDL
7SL17B	mg/kg	0.02	**0.23**	**0.76**	**16**	BDL	BDL	BDL
7SL18A	mg/kg	0.02	**15**	**3.5**	**19**	BDL	BDL	BDL
7SL18B	mg/kg	0.019	**34**	**5.1**	**16**	BDL	BDL	BDL
7SL19A	mg/kg	0.019	BDL	**0.43**	**160**	BDL	BDL	BDL
7SL20A	mg/kg	0.019	**0.38**	BDL	**3.1**	BDL	BDL	BDL
7SL20B	mg/kg	0.02	**0.49**	**0.26**	**4.9**	BDL	BDL	BDL
7SL21A	mg/kg	0.019	**0.6**	**0.7**	**46**	BDL	BDL	BDL
7SL22A	mg/kg	0.02	BDL	BDL	**8.4**	BDL	BDL	BDL
7SL23A	mg/kg	0.02	BDL	BDL	**0.82**	BDL	BDL	BDL
7SL23B	mg/kg	0.019	BDL	BDL	**0.37**	BDL	BDL	BDL
7SL23C	mg/kg	0.02	BDL	BDL	**0.25**	BDL	BDL	BDL

BDL Below Detection Limit
A Sample collected at depth of 0 to 1 foot
B Sample collected at depth of 4 to 5 feet
C Sample collected at depth of 3 feet

TABLE A-8

PHASE I REMEDIAL INVESTIGATION GROUNDWATER DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Counpound	Units	Detection Limit	Sample Location		
			7GW08	7GW41	7GW43
TOTAL METALS:					
Cadmium	ug/l	5	BDL	**6.1**	**9.5**
Chromium	ug/l	7	**218**	**315**	**426**
Copper	ug/l	3	**190**	**753**	**513**
Lead	ug/l	28	**43.8**	**71.9**	**55.2**
Mecury	ug/l	0.2	**2.1**	**2.6**	**1.4**
Zinc	ug/l	3	**68.2**	**250**	**145**
FILTERED METALS:					
Cadmium	ug/l	5	BDL	**6.2**	BDL
Chromium	ug/l	7	BDL	BDL	BDL
Copper	ug/l	3	**12.7**	**14.7**	**21.5**
Lead	ug/l	28	BDL	BDL	BDL
Mecury	ug/l	0.2	BDL	BDL	BDL
Zinc	ug/l	3	**11.7**	**60.2**	**24.2**
NITROAROMATICS:					
2,4,6-TNT	ug/l	10	BDL	BDL	BDL
RDX	ug/l	10	**700**	BDL	BDL
HMX	ug/l	10	**190**	BDL	BDL
2,4-DNT	ug/l	10	BDL	BDL	BDL
2,6-DNT	ug/l	10	BDL	BDL	BDL
1, 3, 5-TNB	ug/l	10	BDL	BDL	BDL
pH	su	--	**4.3**	**5.1**	**5.8**
TOC	mg/l	0.5	**12.1**	**56.1**	**39.7**
TOX	ug/l	8	**13**	**32.3**	**128**
TDS	mg/l	20	BDL	BDL	**244**
TSS	mg/l	4	**22800**	**19300**	**11400**

BDL Below Detection Limit

TABLE A-9

CONFIRMATION STUDY - VERIFICATION PHASE DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Explosives	Units	Detection Limit	A1-0	A1-1	A1-2	A1-3	A1-4	A2-0	A2-1	A2-2	A2-3	A2-4
TNT	mg/kg	10	BDL	BDL	1	NA	NA	14.5	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	43.7	BDL	BDL	NA	NA
HMX	mg/kg	10	BDL	BDL	BDL	NA	NA	28.4	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	3.6	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	2.3	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	0.6	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	A3-0	A3-1	A3-2	A3-3	A3-4	A4-0	A4-1	A4-2	A4-3	A4-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	B1-0	B1-1	B1-2	B1-3	B1-4	B2-0	B2-1	B2-2	B2-3	B2-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	B3-0	B3-1	B3-2	B3-3	B3-4	B4-0	B4-1	B4-2	B4-3	B4-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	C1-0	C1-1	C1-2	C1-3	C1-4	C2-0	C2-1	C2-2	C2-3	C2-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	10	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	2.1	BDL	NA	NA
HMX	mg/kg	10	BDL	BDL	BDL	NA	NA	1.5	41.5	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	1.3	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	0.4	BDL	NA	NA

Explosives	Units	Detection Limit	C3-0	C3-1	C3-2	C3-3	C3-4	C4-0	C4-1	C4-2	C4-3	C4-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	1.1	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

TABLE A-9

CONFIRMATION STUDY - VERIFICATION PHASE DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Explosives	Units	Detection Limit	D1-0	D1-1	D1-2	D1-3	D1-4	D2-0	D2-1	D2-2	D2-3	D2-4
TNT	mg/kg	10	13.6	BDL	BDL	NA	NA	141	10	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	236	1	BDL	NA	NA
HMX	mg/kg	10	13.1	BDL	BDL	NA	NA	72	21	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	2	1	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	1	2	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	D3-0	D3-1	D3-2	D3-3	D3-4	D4-0	D4-1	D4-2	D4-3	D4-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	7	BDL	BDL	NA	NA	2	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	E1-0	E1-1	E1-2	E1-3	E1-4	E2-0	E2-1	E2-2	E2-3	E2-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	76 [3]	1120 [5]	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	193 [3]	66 [3]	2	NA	NA
HMX	mg/kg	10	3	BDL	BDL	NA	NA	116 [3]	114 [3]	2	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	2	26 [3]	BDL	NA	NA

Explosives	Units	Detection Limit	E3-0	E3-1	E3-2	E3-3	E3-4	E4-0	E4-1	E4-2	E4-3	E4-4
TNT	mg/kg	10	2020 [6]	174 [3]	6	BDL	NA	BDL	7	52 [3]	BDL	BDL
RDX	mg/kg	10	2670 [6]	357 [3]	12	1	NA	4	11	112 [3]	BDL	BDL
HMX	mg/kg	10	326 [3]	294 [3]	27	BDL	NA	5	21	131 [3]	BDL	BDL
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	--
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	--
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	--

Explosives	Units	Detection Limit	F1-0	F1-1	F1-2	F1-3	F1-4	F2-0	F2-1	F2-2	F2-3	F2-4
TNT	mg/kg	10	113	16	BDL	NA	NA	6	BDL	BDL	BDL	NA
RDX	mg/kg	10	56	BDL	BDL	NA	NA	BDL	BDL	BDL	BDL	NA
HMX	mg/kg	10	45	2	BDL	NA	NA	238	91	16	BDL	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA

Explosives	Units	Detection Limit	F3-0	F3-1	F3-2	F3-3	F3-4	F4-0	F4-1	F4-2	F4-3	F4-4
TNT	mg/kg	10	9	106 [2]	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	30	10	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	150	312 [2]	8	NA	NA	5	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

TABLE A-9

CONFIRMATION STUDY - VERIFICATION PHASE DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Explosives	Units	Detection Limit	G1-0	G1-1	G1-2	G1-3	G1-4	G2-0	G2-1	G2-2	G2-3	G2-4
TNT	mg/kg	10	9	7	BDL	NA	NA	20	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	135	3	BDL	NA	NA
HMX	mg/kg	10	2	BDL	BDL	NA	NA	315 [3]	294	5	NA	NA
2, 4-DNT	mg/kg	10	3	BDL	BDL	NA	NA	1	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	4	BDL	BDL	NA	NA	1	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	2	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	G3-0	G3-1	G3-2	G3-3	G3-4	G4-0	G4-1	G4-2	G4-3	G4-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	43	5	3	NA	NA	BDL	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	H1-0	H1-1	H1-2	H1-3	H1-4	I1-0	I1-1	I1-2	I1-3	I1-4
TNT	mg/kg	10	BDL	BDL	BDL	BDL	NA	2	BDL	BDL	BDL	NA
RDX	mg/kg	10	3	BDL	BDL	BDL	NA	8	BDL	2	3	NA
HMX	mg/kg	10	128	3	11	2	NA	377 [3]	19	27	18 [2]	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	2	BDL	BDL	--	NA

Explosives	Units	Detection Limit	I2-0	I2-1	I2-2	I2-3	I2-4	I3-0	I3-1	I3-2	I3-3	I3-4
TNT	mg/kg	10	3	BDL	3	1	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	11	BDL	9	4	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	110	2	14	11 [1]	NA	313 [3]	46	6	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	J1-0	J1-1	J1-2	J1-3	J1-4	J2-0	J2-1	J2-2	J2-3	J2-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	2	2	2	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	2	2	4	NA
HMX	mg/kg	10	10	1	BDL	NA	NA	214 [3]	367 [3]	22	11 [1]	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA

Explosives	Units	Detection Limit	J3-0	J3-1	J3-2	J3-3	J3-4	K1-0	K1-1	K1-2	K1-3	K1-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	4	BDL	BDL
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	4	BDL	BDL
HMX	mg/kg	10	8	7	BDL	NA	NA	2	20	341	BDL	BDL
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	--
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	--
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	--

TABLE A-9

CONFIRMATION STUDY - VERIFICATION PHASE DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Explosives	Units	Detection Limit	K2-0	K2-1	K2-2	K2-3	K2-4	K3-0	K3-1	K3-2	K3-3	K3-4
TNT	mg/kg	10	5	662 [3]	4	8	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	3	548 [3]	3	11	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	351	401 [3]	14	73 [3]	NA	2	1	2	NA	NA
2, 4-DNT	mg/kg	10	BDL	13	BDL	--	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	4	BDL	--	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	L1-0	L1-1	L1-2	L1-3	L1-4	L2-0	L2-1	L2-2	L2-3	L2-4
TNT	mg/kg	10	3	2	BDL	NA	NA	11	32	3	73 [4]	NA
RDX	mg/kg	10	9	1	BDL	NA	NA	48	58	4	48 [4]	NA
HMX	mg/kg	10	286	8	2	NA	NA	485	155	13	115 [4]	NA
2, 4-DNT	mg/kg	10	11	BDL	BDL	NA	NA	2	2	BDL	--	NA
2, 6-DNT	mg/kg	10	2	BDL	BDL	NA	NA	3	1	BDL	--	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	--	NA

Explosives	Units	Detection Limit	L3-0	L3-1	L3-2	L3-3	L3-4	M1-0	M1-1	M1-2	M1-3	M1-4
TNT	mg/kg	10	6	BDL	BDL	3	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	6	8	3	8	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	454	125	25	276 [5]	NA	2	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	2	2	BDL	--	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	1	BDL	BDL	--	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	M2-0	M2-1	M2-2	M2-3	M2-4	M3-0	M3-1	M3-2	M3-3	M3-4
TNT	mg/kg	10	12	53	38	46 [5]	2	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	8	187	36	54 [5]	2	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	265	168	116	211 [5]	3	3	9	3	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	--	--	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	--	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	--	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	N1-0	N1-1	N1-2	N1-3	N1-4	N2-0	N2-1	N2-2	N2-3	N2-4
TNT	mg/kg	10	BDL	2	BDL	BDL	NA	49	BDL	237	3	1
RDX	mg/kg	10	2	2	16	1	NA	96	30	410	10	5
HMX	mg/kg	10	30	6	44	3	NA	445 [2]	106	295	35 [2]	1
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	--
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	4	BDL	BDL	--	--
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	--

Explosives	Units	Detection Limit	N3-0	N3-1	N3-2	N3-3	N3-4	O1-0	O1-1	O1-2	O1-3	O1-4
TNT	mg/kg	10	2	4	BDL	1	NA	5	BDL	BDL	BDL	NA
RDX	mg/kg	10	4	2	16	3	NA	108	BDL	5	2	NA
HMX	mg/kg	10	363	133	68	112 [4]	NA	302	9	63	30 [2]	NA
2, 4-DNT	mg/kg	10	3	BDL	BDL	--	NA	BDL	BDL	BDL	--	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	NA	BDL	BDL	BDL	--	NA

TABLE A-9

CONFIRMATION STUDY - VERIFICATION PHASE DATA
SITE 7 - ORDANANCE BURN AREA
NSWC - WHITE OAK, SILVER SPRING, MARYLAND

Explosives	Units	Detection Limit	O2-0	O2-1	O2-2	O2-3	O2-4	O3-0	O3-1	O3-2	O3-3	O3-4
TNT	mg/kg	10	BDL	BDL	210	3 *	3 *	9 *	65 [3]	13	BDL	NA
RDX	mg/kg	10	175	3 *	278	5 *	4 *	2 *	705 [3]	27	5 *	NA
HMX	mg/kg	10	275	292	188	8 *	2 *	173	359 [3]	42	3 *	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	--	--	BDL	BDL	BDL	--	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	--	--	BDL	BDL	BDL	--	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	--	--	BDL	BDL	BDL	--	NA

Explosives	Units	Detection Limit	P1-0	P1-1	P1-2	P1-3	P1-4	P2-0	P2-1	P2-2	P2-3	P2-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	BDL	2 *	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

Explosives	Units	Detection Limit	P3-0	P3-1	P3-2	P3-3	P3-4	Q1-0	Q1-1	Q1-2	Q1-3	Q1-4
TNT	mg/kg	10	BDL	BDL	BDL	NA	NA	2 *	7 *	BDL	NA	NA
RDX	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
HMX	mg/kg	10	2 *	1 *	BDL	NA	NA	18	36	3 *	NA	NA
2, 4-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
2, 6-DNT	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA
1, 3, 5-TNB	mg/kg	10	BDL	BDL	BDL	NA	NA	BDL	BDL	BDL	NA	NA

* Found below method detection limit
-- Interference at TNT retention time
[1] Value obtained from 1:2 dilution of sample extract
[2] Value obtained from 1:5 dilution of sample extract
[3] Value obtained from 1:10 dilution of sample extract
[4] Value obtained from 1:20 dilution of sample extract
[5] Value obtained from 1:50 dilution of sample extract
[6] Value obtained from 1:100 dilution of sample extract
-- Parameter not requested
NA Not Analyzed
BDL Below Detection Limit

APPENDIX B

SOIL AND SEDIMENT SAMPLE LOG SHEETS/FIELD FORMS

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White OAK
Project No.:

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 755 201
Sample Location: Site 7
Sampled By: HP
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
10-15-02	1005	0-6"	LT BROWN	Sand, moist, Large Rocks
Method: Bowl & Spoon				
Monitor Readings (Range in ppm): 0.0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8oz Jar	✓	

OBSERVATIONS / NOTES:

MAP: See Figure 1-2

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Walter

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White Oak
Project No.:

[X] Surface Soil
[ ] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type:

Sample ID No.: 755 202
Sample Location: Site 7
Sampled By: WP
C.O.C. No.:

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
10-14-02	1015	0-6"	LT Brown	Sand, moist, Large rock
Method: Bowl & Spoon				
Monitor Readings (Range in ppm): 0.0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8oz Jar	✓	

OBSERVATIONS / NOTES:

MAP:

See Figure 1-2

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): [illegible]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White Oak
Project No.:

Sample ID No.: 7SS 203
Sample Location: Site 7
Sampled By: MP
C.O.C. No.:

[X] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date:	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
10-15-02	1025	0-6"	LT Brown	Sand, Moist, Large Rocks
Method: Bowl & Spoon				
Monitor Readings (Range in ppm): 0-0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8oz Jar	✓	

OBSERVATIONS / NOTES:

MAP: See Figure 1-2

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	—

Signature(s): [signature]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White Oak
Project No.:

[X] Surface Soil
[ ] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type:

Sample ID No.: 755204
Sample Location: Site 7
Sampled By: WP
C.O.C. No.:

Type of Sample:
[ ] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

Date:	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
10-15-02	1035	0-6"	Brown	Sand, moist, Large Rocks
Method: Bowl & spoon				
Monitor Readings (Range in ppm): 0.0				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8 oz Jar	✓	

OBSERVATIONS / NOTES:

MAP: See Figure 1-2

Circle if Applicable:

MS/MSD	Duplicate ID No.:
—	FD101502-01

Signature(s): Walter [illegible]

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: WHITE OAK
Project No.: CTO 836 4200

Sample ID No.: 07SS205
Sample Location: SITE 7
Sampled By: SIMPSON / WESTERHOFF
C.O.C. No.:

[X] Surface Soil
[ ] Subsurface Soil
[ ] Sediment
[ ] Other:
[ ] QA Sample Type:

Type of Sample:
[X] Low Concentration
[ ] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:			
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 11.7.02	1325	0-6"	BRN	F TO C SAND WITH
Method:	1327	↓	↓	GRAVEL (WELL ROUNDED)
BOWL & SPOON	1329			MOIST
Monitor Readings	1330			TR. SILT
(Range in ppm):	1332			
0	1334	↓	↓	

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
EXPLOSIVES	1- 8 oz JAR	✓	

OBSERVATIONS / NOTES:

SAMPLE TIME = 1335

MAP:

SEE FIGURE 1-3

4 ~~X~~ US SIDE WALL
2 BTM
> SAMPLES

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White Oak
Project No.: 4200

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 0750 201
Sample Location: Site 7
Sampled By: WP
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 10-15-02 Time: 1220 Method: Bowl & Spoon Monitor Reading (ppm): 0.0	0-6"	DK Brown	Sand with some silts moist, small rocks & organics

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8 oz Jar	✓	

OBSERVATIONS / NOTES:

MAP: See Figure 1-2

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): Walter [illegible]

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White Oak
Project No.: 4200

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 07 SD 202
Sample Location: Site 7
Sampled By: MP
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 10-15-02 Time: 1225 Method: Bowl & Spoon Monitor Reading (ppm): 0.0	0-6"	LT & DK Brown Mix	Sand, moist, organics

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8oz Jar	✓	

OBSERVATIONS / NOTES:

MAP:

See Figure 1-2

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Walter E Pyne

Tetra Tech NUS, Inc.

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: White Oak
Project No.: 4200

[] Surface Soil
[] Subsurface Soil
[X] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 0750 203
Sample Location: Site 7
Sampled By: WP
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 10-15-02 Time: 1230 Method: Bowl & spoon Monitor Reading (ppm): 0.0	0-6'	DK Brown	Sand with some silts, moist small rocks, with organics

COMPOSITE SAMPLE DATA:

Date:	Time	Depth Interval	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
Explosives	1-8 oz Jar	✓	

OBSERVATIONS / NOTES:

MAP: See Figure 1-2

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Watts

TRA TECH NUS, INC. CHAIN OF CUSTODY NUMBER PAGE 1 OF 1

PROJECT NO: 4200	SITE NAME: White Oak	PROJECT MANAGER AND PHONE NUMBER: Scott Nesbit (412) 921-7134	LABORATORY NAME AND CONTACT: Lauck's Ann Ho
SAMPLERS (SIGNATURE): Walter S Page III		FIELD OPERATIONS LEADER AND PHONE NUMBER: Walter Page III (301) 529-3075	ADDRESS: 940 South Hinney Street
		CARRIER/WAYBILL NUMBER: 8322 9030 1456	CITY, STATE: Seattle, WA 98108

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G
PRESERVATIVE USED: 4°

DATE YEAR 2002	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: Explosives							COMMENTS
11/15	1005	0755 201	soil	C	1	1							
	1015	0755 202			1	1							
	1025	0755 203			1	1							
	1035	0755 204			1	1							
	0000	FD 101502-01			1	1							* Dup
	1220	0750 201		G	1	1							
	1225	0750 202			1	1							
	1230	0750 203			1	1							

	DATE	TIME		DATE	TIME
1. RELINQUISHED BY: Walter Page III	10-15-02	1100	1. RECEIVED BY		
2. RELINQUISHED BY			2. RECEIVED BY		
3. RELINQUISHED BY			3. RECEIVED BY		

COMMENTS

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY)

3/99
FORM NO. TtNUS-001

TETRA TECH NUS, INC. CHAIN OF CUSTODY | NUMBER | PAGE 1 OF 1

PROJECT NO: CTO 836 #4200	SITE NAME: WHITE OAK	PROJECT MANAGER AND PHONE NUMBER: SCOTT NESBIT 412 921 7134	LABORATORY NAME AND CONTACT: LAUCKS
SAMPLERS (SIGNATURE): Keith S. Simpson		FIELD OPERATIONS LEADER AND PHONE NUMBER: KEITH SIMPSON 412 921 8131	ADDRESS:
		CARRIER/WAYBILL NUMBER: FEDEX 8316 7332 8666	CITY, STATE: SEATTLE, WA

STANDARD TAT ☐
RUSH TAT ☐
☐ 24 hr. ☒ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

CONTAINER TYPE PLASTIC (P) or GLASS (G): G

PRESERVATIVE USED: 4°C

DATE YEAR 2002	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	TYPE OF ANALYSIS: EXPLOSIVES								COMMENTS
		SITE 7 SOIL												
11/7	1335	07SS205	S	C	1	1								

1. RELINQUISHED BY: Keith S. Simpson	DATE 11.7.02	TIME 1900	1. RECEIVED BY: FEDEX	DATE 11.7.02	TIME 1900
2. RELINQUISHED BY	DATE	TIME	2. RECEIVED BY	DATE	TIME
3. RELINQUISHED BY	DATE	TIME	3. RECEIVED BY	DATE	TIME

COMMENTS

DISTRIBU : WHITE (ACCOMPANIES SAMPLE) YELLOW (FIE COPY) PINK (FILE COPY)

APPENDIX C

DATA VALIDATION LETTERS

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**S. NESBIT**	**DATE**	**DECEMBER 12, 2002**
FROM:	**BERNARD F SPADA III**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION- EXP CTO 836, NSWC WHITE OAK SDG 0210324**		

SAMPLES: 8/Soil/Sediment

07SD201	07SD202	07SD203
07SS201	07SS202	07SS203
07SS204	FD101502-01	

Overview

The sample set for CTO 836 NSWC White Oak, SDG 0210324 consists of four (4) environmental soil samples, three (3) environmental sediment samples, and one (1) field duplicate. All environmental samples were analyzed for explosives (EXP) by SW-846 Method 8330. The field duplicate pair included in this SDG is FD101502-01 and 07SS204.

The samples were collected by Tetra Tech NUS on October 15, 2002 and analyzed by Laucks Testing Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Method 8330 analytical and reporting protocols.

All samples were successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike/blank spike duplicate results, chromatographic resolution, compound identification, compound quantitation and detection limits. Areas of concern are listed below.

Major

- None.

Minor

- The results for HMX in the field duplicate pair FD101502-01 and 07SS204 exceeded the 50% relative percent difference quality control criteria. The results for HMX were qualified as estimated (J) in the aforementioned samples.

Notes

The laboratory's Form X for sample FD101502-01 states that the result for HMX (9.7 mg/kg) was reported from the C18 column. The reviewer found that the raw data shows that the calculated value from the C18 column is 8.93 mg/kg which corresponds to the CN column on the Form X. It appears that the Form X has the values transposed between columns. No action was taken on this basis.

Executive Summary

Laboratory Performance: None.

Other Factors Affecting Data Quality: Qualifications were made based on field duplicate imprecision.

The data for these analyses were reviewed with reference to U.S. EPA National Functional Guidelines for Data Validation as modified by EPA Region III (9/94) and the NFESC guidelines entitled Navy IRCDQM (Sept. 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Tetra Tech NUS
Bernard F Spada III
Chemist/Data Validator

Tetra Tech NUS
Joseph A. Samchuck
Quality Assurance Officer

Attachments:

Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
Appendix C – Support Documentation

Appendix A

Qualified Analytical Results

Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
C = Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
N01 = Internal Standard Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity

PROJ_NO: 4200

SDG: 0210324 MEDIA: SOIL DATA FRACTION: EXP

nsample	07SD201	nsample	07SD202	nsample	07SD203
samp_date	10/15/2002	samp_date	10/15/2002	samp_date	10/15/2002
lab_id	0210324-06	lab_id	0210324-07	lab_id	0210324-08
qc_type	NM	qc_type	NM	qc_type	NM
units	MG/KG	units	MG/KG	units	MG/KG
Pct_Solids	74	Pct_Solids	88	Pct_Solids	84
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.68	U	
1,3-DINITROBENZENE	0.68	U	
2,4,6-TRINITROTOLUENE	0.68	U	
2,4-DINITROTOLUENE	0.68	U	
2,6-DINITROTOLUENE	0.68	U	
2-AMINO-4,6-DINITROTOLUENE	0.68	U	
2-NITROTOLUENE	0.68	U	
3-NITROTOLUENE	0.68	U	
4-AMINO-2,6-DINITROTOLUENE	0.68	U	
4-NITROTOLUENE	0.68	U	
HMX	0.68	U	
NITROBENZENE	0.68	U	
RDX	0.68	U	
TETRYL	0.68	U	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.57	U	
1,3-DINITROBENZENE	0.57	U	
2,4,6-TRINITROTOLUENE	0.57	U	
2,4-DINITROTOLUENE	0.57	U	
2,6-DINITROTOLUENE	0.57	U	
2-AMINO-4,6-DINITROTOLUENE	0.57	U	
2-NITROTOLUENE	0.57	U	
3-NITROTOLUENE	0.57	U	
4-AMINO-2,6-DINITROTOLUENE	0.57	U	
4-NITROTOLUENE	0.57	U	
HMX	0.57	U	
NITROBENZENE	0.57	U	
RDX	0.57	U	
TETRYL	0.57	U	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.6	U	
1,3-DINITROBENZENE	0.6	U	
2,4,6-TRINITROTOLUENE	0.6	U	
2,4-DINITROTOLUENE	0.6	U	
2,6-DINITROTOLUENE	0.6	U	
2-AMINO-4,6-DINITROTOLUENE	0.6	U	
2-NITROTOLUENE	0.6	U	
3-NITROTOLUENE	0.6	U	
4-AMINO-2,6-DINITROTOLUENE	0.6	U	
4-NITROTOLUENE	0.6	U	
HMX	0.6	U	
NITROBENZENE	0.6	U	
RDX	0.6	U	
TETRYL	0.6	U	

PROJ_NO: 4200

SDG: 0210324 MEDIA: SOIL DATA FRACTION: EXP

nsample	07SS201	nsample	07SS202	nsample	07SS203
samp_date	10/15/2002	samp_date	10/15/2002	samp_date	10/15/2002
lab_id	0210324-01	lab_id	0210324-02	lab_id	0210324-03
qc_type	NM	qc_type	NM	qc_type	NM
units	MG/KG	units	MG/KG	units	MG/KG
Pct_Solids	95	Pct_Solids	96	Pct_Solids	96
DUP_OF:		DUP_OF:		DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.53	U	
1,3-DINITROBENZENE	0.53	U	
2,4,6-TRINITROTOLUENE	0.53	U	
2,4-DINITROTOLUENE	0.53	U	
2,6-DINITROTOLUENE	0.53	U	
2-AMINO-4,6-DINITROTOLUENE	0.53	U	
2-NITROTOLUENE	0.53	U	
3-NITROTOLUENE	0.53	U	
4-AMINO-2,6-DINITROTOLUENE	0.53	U	
4-NITROTOLUENE	0.53	U	
HMX	0.53	U	
NITROBENZENE	0.53	U	
RDX	0.53	U	
TETRYL	0.53	U	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.52	U	
1,3-DINITROBENZENE	0.52	U	
2,4,6-TRINITROTOLUENE	0.52	U	
2,4-DINITROTOLUENE	0.52	U	
2,6-DINITROTOLUENE	0.52	U	
2-AMINO-4,6-DINITROTOLUENE	0.52	U	
2-NITROTOLUENE	0.52	U	
3-NITROTOLUENE	0.52	U	
4-AMINO-2,6-DINITROTOLUENE	0.52	U	
4-NITROTOLUENE	0.52	U	
HMX	0.52	U	
NITROBENZENE	0.52	U	
RDX	0.52	U	
TETRYL	0.52	U	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.52	U	
1,3-DINITROBENZENE	0.52	U	
2,4,6-TRINITROTOLUENE	0.52	U	
2,4-DINITROTOLUENE	0.52	U	
2,6-DINITROTOLUENE	0.52	U	
2-AMINO-4,6-DINITROTOLUENE	0.52	U	
2-NITROTOLUENE	0.52	U	
3-NITROTOLUENE	0.52	U	
4-AMINO-2,6-DINITROTOLUENE	0.52	U	
4-NITROTOLUENE	0.52	U	
HMX	0.52	U	
NITROBENZENE	0.52	U	
RDX	0.52	U	
TETRYL	0.52	U	

PROJ_NO: 4200

SDG: 0210324 MEDIA: SOIL DATA FRACTION: EXP

nsample	07SS204
samp_date	10/15/2002
lab_id	0210324-04
qc_type	NM
units	MG/KG
Pct_Solids	91
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.55	U	
1,3-DINITROBENZENE	0.55	U	
2,4,6-TRINITROTOLUENE	0.55	U	
2,4-DINITROTOLUENE	0.55	U	
2,6-DINITROTOLUENE	0.55	U	
2-AMINO-4,6-DINITROTOLUENE	0.55	U	
2-NITROTOLUENE	0.55	U	
3-NITROTOLUENE	0.55	U	
4-AMINO-2,6-DINITROTOLUENE	0.55	U	
4-NITROTOLUENE	0.55	U	
HMX	4.2	J	G
NITROBENZENE	0.55	U	
RDX	2.1		
TETRYL	0.55	U	

nsample	FD101502-01
samp_date	10/15/2002
lab_id	0210324-05
qc_type	NM
units	MG/KG
Pct_Solids	92
DUP_OF:	07SS204

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.54	U	
1,3-DINITROBENZENE	0.54	U	
2,4,6-TRINITROTOLUENE	0.54	U	
2,4-DINITROTOLUENE	0.54	U	
2,6-DINITROTOLUENE	0.54	U	
2-AMINO-4,6-DINITROTOLUENE	0.54	U	
2-NITROTOLUENE	0.54	U	
3-NITROTOLUENE	0.54	U	
4-AMINO-2,6-DINITROTOLUENE	0.54	U	
4-NITROTOLUENE	0.54	U	
HMX	9.7	J	G
NITROBENZENE	0.54	U	
RDX	1.3		
TETRYL	0.54	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**MR. S. NESBIT**	**DATE:**	**NOVEMBER 25, 2002**
FROM:	**SETH C. STAFFEN**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION - EXPLOSIVES CTO 836; NSWC WHITE OAK, MD SDG: 83603**		
SAMPLES:	1/Soil 07SS205		

OVERVIEW

The sample set for CTO 836, SDG: 83603; NSWC White Oak, MD consists of one (1) soil environmental sample. The sample was analyzed for explosive compounds. No field duplicate pairs were included in this SDG.

The sample was collected by Tetra Tech NUS, Inc. on November 7, 2002 and analyzed by Laucks Testing Laboratories. The analysis was conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Method 8330 analytical and reporting protocol.

The sample was successfully analyzed. The findings offered in this report are based upon a general review of all available data including: data completeness, holding times, initial/continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

Major Problems

- There were no major problems noted that would have resulted in the rejection of data.

Minor Problems

- There were no minor problems noted that would have resulted in the qualification of data.

EXECUTIVE SUMMARY

Laboratory Performance Issues: None.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (September, 1994) as modified by Region III and the NFESC guidelines "IRCDQM" (September, 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Seth C. Staffen
Environmental Scientist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

Qualifier Codes:

A	=	Lab Blank Contamination
B	=	Field Blank Contamination
C	=	Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
D	=	MS/MSD Noncompliance
E	=	LCS/LCSD Noncompliance
F	=	Lab Duplicate Imprecision
G	=	Field Duplicate Imprecision
H	=	Holding Time Exceedance
I	=	ICP Serial Dilution Noncompliance
J	=	GFAA PDS - GFAA MSA's $r < 0.995$
K	=	ICP Interference - include ICSAB % R's
L	=	Instrument Calibration Range Exceedance
M	=	Sample Preservation
N	=	Internal Standard Noncompliance
N01	=	Internal Standard Noncompliance Dioxins
N02	=	Recovery Standard Noncompliance Dioxins
N03	=	Clean-up Standard Noncompliance Dioxins
O	=	Poor Instrument Performance (i.e., base-time drifting)
P	=	Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q	=	Other problems (can encompass a number of issues)
R	=	Surrogates Recovery Noncompliance.
S	=	Pesticide/PCB Resolution
T	=	% Breakdown Noncompliance for DDT and Endrin
U	=	Pest/PCD% between columns for positive results
V	=	Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W	=	EMPC result
X	=	Signal to noise response drop
Y	=	Percent solids <30%
Z	=	Uncertainty at 2 sigma deviation is less than sample activity

PROJ_NO: 4200

SDG: 83603 MEDIA: SOIL DATA FRACTION: EXP

nsample	07SS205
samp_date	11/7/2002
lab_id	0211361-01
qc_type	NM
units	MG/KG
Pct_Solids	100
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.5	U	
1,3-DINITROBENZENE	0.5	U	
2,4,6-TRINITROTOLUENE	0.5	U	
2,4-DINITROTOLUENE	0.5	U	
2,6-DINITROTOLUENE	0.5	U	
2-AMINO-4,6-DINITROTOLUENE	0.5	U	
2-NITROTOLUENE	0.5	U	
3-NITROTOLUENE	0.5	U	
4-AMINO-2,6-DINITROTOLUENE	0.5	U	
4-NITROTOLUENE	0.5	U	
HMX	0.5	U	
NITROBENZENE	0.5	U	
RDX	0.5	U	
TETRYL	0.5	U	

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

TO:	**S. NESBIT**	**DATE:**	**DECEMBER 20, 2002**
FROM:	**EDWARD SEDLMYER**	**COPIES:**	**DV FILE**
SUBJECT:	**ORGANIC DATA VALIDATION- EXP CTO 836, NSWC WHITE OAK SDG 83604**		
SAMPLES:	2/Solid		
	7SS206 7SS207		

OVERVIEW

The sample set for CTO 836 NSWC White Oak, SDG 83604 consists of two (2) soil environmental samples. The samples were analyzed for explosives.

The samples were collected by TetraTech NUS on November 21, 2002 and analyzed by Laucks Testing Laboratories. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8330 analysis and reporting protocols. The findings in this report are based upon a general review of all available data including: data completeness, holding times, initial / continuing calibrations, laboratory method blank results, surrogate spike recoveries, blank spike results, matrix spike/matrix spike duplicate results, field duplicate results, compound identification, compound quantitation, and detection limits. Areas of concern are listed below.

Minor Problems

- The percent difference between columns exceeded 25% for the following compounds. The positive results were reported as estimated, J for the compounds below:

Sample	Compound	%D
7SS207	4-Amino-2,6-dinitrotoluene	182.5%
7SS207	2-Amino-4,6-dinitrotoluene	71.3%

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several %Ds exceeded the quality control limit between columns for positive results.

Other factors affecting data quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (9/94) as modified by Region III and the NFESC guidelines IRCDQM (Sept., 1999). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

Edward Sedlmyer
Tetra Tech NUS

Edward Sedlmyer
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

Appendix A – Qualified Analytical Results
Appendix B – Results as Reported by the Laboratory
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APPENDIX A

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Qualifier Codes:

A = Lab Blank Contamination
B = Field Blank Contamination
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D = MS/MSD Noncompliance
E = LCS/LCSD Noncompliance
F = Lab Duplicate Imprecision
G = Field Duplicate Imprecision
H = Holding Time Exceedance
I = ICP Serial Dilution Noncompliance
J = GFAA PDS - GFAA MSA's $r < 0.995$
K = ICP Interference - include ICSAB % R's
L = Instrument Calibration Range Exceedance
M = Sample Preservation
N = Internal Standard Noncompliance
N01 = Internal Standard Noncompliance Dioxins
N02 = Recovery Standard Noncompliance Dioxins
N03 = Clean-up Standard Noncompliance Dioxins
O = Poor Instrument Performance (i.e., base-time drifting)
P = Uncertainty near detection limit (< 2 x IDL for inorganics and <CRQL for organics)
Q = Other problems (can encompass a number of issues)
R = Surrogates Recovery Noncompliance
S = Pesticide/PCB Resolution
T = % Breakdown Noncompliance for DDT and Endrin
U = Pest/PCD% between columns for positive results
V = Non-linear calibrations, tuning $r < 0.995$ (correlation coefficient)
W = EMPC result
X = Signal to noise response drop
Y = Percent solids <30%
Z = Uncertainty at 2 sigma deviation is less than sample activity

PROJ_NO: 4200

SDG: 83604 MEDIA: SOIL DATA FRACTION: EX

nsample	7SS206
samp_date	11/21/2002
lab_id	0211486-01
qc_type	NM
units	MG/KG
Pct_Solids	85
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.5	U	
1,3-DINITROBENZENE	0.5	U	
2,4,6-TRINITROTOLUENE	0.5	U	
2,4-DINITROTOLUENE	0.5	U	
2,6-DINITROTOLUENE	0.5	U	
2-AMINO-4,6-DINITROTOLUENE	0.5	U	
2-NITROTOLUENE	0.5	U	
3-NITROTOLUENE	0.5	U	
4-AMINO-2,6-DINITROTOLUENE	0.5	U	
4-NITROTOLUENE	0.5	U	
HMX	0.5	U	
NITROBENZENE	0.5	U	
RDX	0.5	U	
TETRYL	0.5	U	

nsample	7SS207
samp_date	11/21/2002
lab_id	0211486-02
qc_type	NM
units	MG/KG
Pct_Solids	85
DUP_OF:	

Parameter	Result	Val Qual	Qual Code
1,3,5-TRINITROBENZENE	0.5	U	
1,3-DINITROBENZENE	0.5	U	
2,4,6-TRINITROTOLUENE	0.5	U	
2,4-DINITROTOLUENE	0.5	U	
2,6-DINITROTOLUENE	0.5	U	
2-AMINO-4,6-DINITROTOLUENE	1.9	J	U
2-NITROTOLUENE	0.5	U	
3-NITROTOLUENE	0.5	U	
4-AMINO-2,6-DINITROTOLUENE	1.1	J	U
4-NITROTOLUENE	0.5	U	
HMX	4		
NITROBENZENE	0.5	U	
RDX	0.5	U	
TETRYL	0.5	U	

APPENDIX D

RISK ASSESSMENT DATA

TABLE 1

SELECTION OF EXPOSURE PATHWAYS FOR POST-REMOVAL SOIL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
	Surface Soil	Surface Soil	Entire Site	All Potential Receptors, i.e., Workers, Recreational Users, Trespassers, Day Care Center Children, and Future Residents	Adult, Child, Adolescent	Ingestion	On-site	Quant(1)	Exposure to surface soil may occur if potential receptors are exposed during typical receptor-related activities, such as digging and playing.
						Dermal	On-site	Quant(1)	Exposure to surface soil may occur if potential receptors are exposed during typical receptor-related activities, such as digging and playing.
		Air	Vapors and Particulates in Air - Entire Site	All Potential Receptors, i.e., Workers, Recreational Users, Trespassers, Day Care Center Children, and Future Residents	Adult, Child, Adolescent	Inhalation	On-site	Qual(2)	Exposure is evaluated qualitatively by a comparison of site data to USEPA Generic SSLs (3)for transfers from soil to air.

Footnotes:

1 Quantitative.

2 Qualitative.

3 Soil Screening Levels (USEPA, May 1996).

TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF POTENTIAL CONSTITUENTS OF CONCERN
POST-REMOVAL SURFACE SOIL - SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Entire Site

CAS Numb	Chemical	Minimum Concentration	Minimum Qualifier	Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Nondetects (1)	Concentration Used for Screening(2)	Background Value	Risk-Based Residential PCOC Screening Level(3)		Potential ARAR/ TBC Value	Potential ARAR/ TBC Source	PCOC Flag	Rationale for Contaminant Deletion or Selection(4)
Explosives (mg/kg)																	
35572-78-2	2-Amino-4,6-dinitrotoluene	2.2		2.2		mg/kg	07SS007	1/7	0.52 - 0.68	2.2	NA	0.47	N	NA	SSL_MIGR SSL_INH	Yes	ASL
19406-51-0	4-Amino-2,6-dinitrotoluene	1.3		1.3		mg/kg	07SS007	1/7	0.52 - 0.68	1.3	NA	0.47	N	NA	SSL_MIGR SSL_INH	Yes	ASL
2691-41-0	HMX	4.7	J	9.7	J	mg/kg	07SS204D	2/7	0.52 - 0.68	9.7	NA	390	N	NA	SSL_MIGR SSL_INH	No	BSL
121-82-4	RDX	2.1	J	2.1	J	mg/kg	07SS204	1/7	0.52 - 0.68	2.1	NA	5.8	C	NA	SSL_MIGR SSL_INH	No	BSL

Shaded cells indicate that the maximum concentration exceeds the specified criterion or constituent has been selected as a PCOC.

Footnotes:

1 Values presented are sample-specific quantitation limits.
2 The maximum detected concentration is used for screening purposes.
3 The risk based soil COPC screening level for residential land use is presented. The value is based on a target hazard quotient of 0.1 for noncarcinogens (denoted with a "N" flag) or an incremental cancer risk of 1E-6 for carcinogens (denoted with a "C" flag) (USEPA, Region III, October 2002).
4 The chemical is selected as a PCOC if the maximum detected concentration exceeds the risk-based PCOC screening level and facility-wide background levels.

Associated Samples:

07SS201	07SS204D
07SS202	07SS205
07SS203	07SS206
07SS204	07SS207

Rationale Codes:
For Selection as a PCOC:
ASL = Above PCOC Screening Level

For Elimination as a PCOC
BSL = Below PCOC Screening Level

Definitions
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered
C = Carcinogen
J = Estimated Value
N = Noncarcinogen
NA = Not Applicable/Not Available.
PCOC = Potential Constituent of Concern
SSL-INH = Soil Screening Level for transfers from soil to air (Inhalation) (USEPA, May 1996)
SSL-MIGR = Soil Screening Level for transfers from soil to groundwater for a Dilution and Attenuation Factor of 20 (USEPA, Region 3, April 2002)

TABLE 3.1

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY - SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil

Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of Normal Data	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency Exposure		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
2-Amino-4,6-dinitrotoluene	mg/kg	5.43E-01	NA	2.20E+00		mg/kg	2.20E+00	Maximum	N<10(1)	2.20E+00	Maximum	N<10(1)
4-Amino-2,6-dinitrotoluene	mg/kg	4.14E-01	NA	1.30E+00		mg/kg	1.30E+00	Maximum	N<10(1)	1.30E+00	Maximum	N<10(1)
HMX	mg/kg	1.85E+00	NA	6.95E+00	J	mg/kg	6.95E+00	Maximum	N<10(1)	6.95E+00	Maximum	N<10(1)
RDX	mg/kg	4.18E-01	NA	2.10E+00	J	mg/kg	2.10E+00	Maximum	N<10(1)	2.10E+00	Maximum	N<10(1)

(1) Less than 10 groundwater samples collected. Therefore, maximum concentration is used as the exposure point concentration for the RME and CTE.

TABLE 5.1

NON-CANCER TOXICITY DATA FOR CHEMICALS OF CONCERN -- ORAL/DERMAL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD	Oral RfD Units	Oral to Dermal Adjustment Factor(1)	Adjusted Dermal RfD(2)	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ
2-Amino-4,6-dinitrotoluene	chronic	6.0E-05	mg/kg-day	1	6.00E-05	mg/kg-day	Liver	NA	NCEA	10/09/02
4-Amino-2,6-dinitrotoluene	chronic	6.0E-05	mg/kg-day	1	6.00E-05	mg/kg-day	Liver	NA	NCEA	10/09/02
HMX	chronic	5.2E-02	mg/kg-day	1	5.20E-02	mg/kg-day	Liver, Blood	1,000	IRIS	02/07/03
RDX	chronic	3.0E-03	mg/kg-day	1	3.00E-03	mg/kg-day	Prostate	100	IRIS	02/07/03

(1) USEPA, September 2001 .
(2) RfD dermal = RfDoral x (Oral to Dermal Adjustment Factor)

Notes: RfD = Reference dose
IRIS = Integrated Risk Information System, on-line database search (USEPA, February 2003)
NCEA = USEPA National Center for Environmental Assessment (USEPA RBC Table, October, 2002)
NA = Not applicable/Not Available

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Chemical of Potential Concern	Oral CSF	Oral to Dermal Adjustment Factor(1)	Adjusted Dermal Cancer Slope Factor(2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
RDX	1.1E-01	1	1.10E-01	$(mg/kg\text{-}day)^{-1}$	C	IRIS	2/7/2003

(1) USEPA, September 2001.
(2) CSFdermal = CSForal/(Oral to Dermal Adjustment Factor)

Notes:
CSF = Cancer Slope Factor
IRIS = Integrated Risk Information System, on-line database search (USEPA, February 2003)

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

TABLE 4.1

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF FULL TIME WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Full Time Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	100	USEPA, May 1993	50	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	250	USEPA, May 1993	219	USEPA, May 1993	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	25	USEPA, May 1993	9	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	9,125	USEPA, December 1989	3,285	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.2	USEPA, September 2001	0.02	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	3,300	USEPA, September 2001	3,300	USEPA, September 2001	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	250	USEPA, May 1993	219	USEPA, May 1993	
	ED	Exposure Duration	(years)	25	USEPA, May 1993	9	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	9,125	USEPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	3.49E-07	Cancer Ingestion Intake - CTE	5.51E-08
Noncancer Ingestion Intake - RME	9.78E-07	Noncancer Ingestion Intake - CTE	4.29E-07
Cancer Dermal Intake - RME	2.31E-06	Cancer Dermal Intake - CTE	7.27E-08
Noncancer Dermal Intake - RME	6.46E-06	Noncancer Dermal Intake - CTE	5.66E-07

TABLE 7.1. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF FULL TIME WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Full Time Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.2E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.6E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.3E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.1E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	6.8E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.4E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.1E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	6.8E-04
	(total)												5.8E-02
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.4E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.4E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	8.4E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.4E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	4.5E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	9.0E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.4E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.5E-04
	(total)												3.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**9.6E-02**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.1. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF FULL TIME WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Full Time Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.7E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.5E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.4E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.3E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	8.1E-08
	(total)										8.1E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	5.1E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	3.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.6E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.8E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	5.3E-08
	(total)										5.3E-08
										Total Risk Across All Exposure Routes/Pathways	**1.3E-07**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.1a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF FULL TIME WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Full Time Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	9.4E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.6E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.6E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	9.3E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.0E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	6.0E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.0E-04
	(total)												2.5E-02
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.2E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.1E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	7.4E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.9E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	7.9E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.2E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.0E-05
	(total)												3.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	**2.9E-02**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.1a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF FULL TIME WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Full Time Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.2E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	7.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.8E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.2E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.3E-08
	(total)										1.3E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.6E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	9.5E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	5.1E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.5E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.7E-09
	(total)										1.7E-09
										Total Risk Across All Exposure Routes/Pathways	**1.4E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.2

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF MAINTENANCE / UTILITY WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	100	USEPA, May 1993	50	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional Judgement	26	Professional Judgement	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	10	Professional Judgement	10	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	43	USEPA, December 1989	43	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	3,650	USEPA, December 1989	3,650	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.3	USEPA, September 2001	0.04	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	3,263	USEPA, August 1997	3,263	USEPA, August 1997	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	52	Professional Judgement	26	Professional Judgement	
	ED	Exposure Duration	(years)	10	Professional Judgement	10	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	43	USEPA, August 1997	43	USEPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	3,650	USEPA, December 1989	3,650	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	4.73E-08	Cancer Ingestion Intake - CTE	1.18E-08
Noncancer Ingestion Intake - RME	3.31E-07	Noncancer Ingestion Intake - CTE	8.28E-08
Cancer Dermal Intake - RME	4.63E-07	Cancer Dermal Intake - CTE	3.09E-08
Noncancer Dermal Intake - RME	3.24E-06	Noncancer Dermal Intake - CTE	2.16E-07

TABLE 7.2. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF MAINTENANCE / UTILITY WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.3E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.3E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.2E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.3E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.6E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	(total)												2.0E-02
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.2E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.0E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.3E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.5E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	6.8E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	(total)												1.9E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**3.9E-02**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.2. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF MAINTENANCE / UTILITY WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.3E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.9E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										1.1E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.0E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.2E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.7E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										1.1E-08
										Total Risk Across All Exposure Routes/Pathways	**2.2E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.2a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF MAINTENANCE / UTILITY WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.8E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.0E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.8E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	5.8E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.2E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.7E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.8E-05
	(total)												4.9E-03
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.9E-04
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	4.7E-04
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.5E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.0E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.5E-05
	(total)												1.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	**6.2E-03**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.2a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF MAINTENANCE / UTILITY WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.6E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.5E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	8.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.5E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	(total)										2.7E-09
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	6.8E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.0E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.1E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	6.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-10
	(total)										7.1E-10
										Total Risk Across All Exposure Routes/Pathways	**3.4E-09**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.3

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	480	USEPA, May 1993	240	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	180	Professional Judgement	180	Professional Judgement	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	365	USEPA, December 1989	365	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.3	USEPA, September 2001	0.1	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	3,300	USEPA, September 2001	3,300	USEPA, September 2001	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	180	Professional Judgement	180	Professional Judgement	
	ED	Exposure Duration	(years)	1	Professional Judgement	1	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	365	USEPA, December 1989	365	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	4.83E-08	Cancer Ingestion Intake - CTE	2.42E-08
Noncancer Ingestion Intake - RME	3.38E-06	Noncancer Ingestion Intake - CTE	1.69E-06
Cancer Dermal Intake - RME	9.96E-08	Cancer Dermal Intake - CTE	3.32E-08
Noncancer Dermal Intake - RME	6.97E-06	Noncancer Dermal Intake - CTE	2.32E-06

TABLE 7.3. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.4E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-01
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.4E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.3E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.4E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.7E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.1E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.4E-03
	(total)												2.0E-01
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.5E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.6E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	9.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.5E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	4.8E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	9.7E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.5E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.9E-04
	(total)												4.1E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**2.4E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.3. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.1E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.3E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.4E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.0E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										1.1E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.3E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	6.9E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.3E-09
	(total)										2.3E-09
										Total Risk Across All Exposure Routes/Pathways	**1.3E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.3a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	3.7E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	6.2E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.2E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.7E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.2E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.4E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	3.6E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.2E-03
	(total)												1.0E-01
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	5.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	8.5E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	3.0E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	5.0E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.6E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.2E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.9E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.6E-04
	(total)												1.4E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.3a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF CONSTRUCTION WORKERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Construction Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	5.3E-08	mg/kg-day	NA	(mg/kg-day)$^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	3.1E-08	mg/kg-day	NA	(mg/kg-day)$^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.7E-07	mg/kg-day	NA	(mg/kg-day)$^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	5.1E-08	mg/kg-day	1.10E-01	(mg/kg-day)$^{-1}$	5.6E-09
	(total)										5.6E-09
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.3E-09	mg/kg-day	NA	(mg/kg-day)$^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.3E-09	mg/kg-day	NA	(mg/kg-day)$^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.3E-08	mg/kg-day	NA	(mg/kg-day)$^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.0E-09	mg/kg-day	1.10E-01	(mg/kg-day)$^{-1}$	7.7E-10
	(total)										7.7E-10
										Total Risk Across All Exposure Routes/Pathways	**6.3E-09**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.4

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adult Recreational User
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	100	USEPA, May 1993	50	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	16	Professional Judgement	8	Professional Judgement	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	30	USEPA, May 1993	9	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	10,950	USEPA, December 1989	3,285	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.08	USEPA, September 2001	0.01	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	9,000	USEPA, Augsut 1997	9,000	USEPA, Augsut 1997	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	16	Professional Judgement	8	Professional Judgement	
	ED	Exposure Duration	(years)	30	USEPA, May 1993	9	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	10,950	USEPA, December 1989	3,285	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	2.68E-08	Cancer Ingestion Intake - CTE	2.01E-09
Noncancer Ingestion Intake - RME	6.26E-08	Noncancer Ingestion Intake - CTE	1.57E-08
Cancer Dermal Intake - RME	1.93E-07	Cancer Dermal Intake - CTE	3.62E-09
Noncancer Dermal Intake - RME	4.51E-07	Noncancer Dermal Intake - CTE	2.82E-08

TABLE 7.4. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adult Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.4E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.3E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	8.1E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.4E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	4.4E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	8.7E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.3E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	4.4E-05
	(total)												3.7E-03
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	9.9E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.7E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.9E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	9.8E-04
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.1E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	6.3E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.2E-05
	(total)												2.7E-03
												Total Hazard Index Across All Exposure Routes/Pathways	**6.4E-03**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.4. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adult Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	5.9E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	3.5E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.9E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	5.6E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	6.2E-09
	(total)										6.2E-09
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.3E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.5E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.3E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.5E-09
	(total)										4.5E-09
										Total Risk Across All Exposure Routes/Pathways	**1.1E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.4a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adult Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	3.4E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	5.7E-04
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.0E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.4E-04
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.1E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.2E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	3.3E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.1E-05
	(total)												9.3E-04
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	6.2E-09	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.0E-04
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	3.7E-09	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	6.1E-05
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.0E-08	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.9E-07
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	5.9E-09	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.0E-06
	(total)												1.7E-04
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-03**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.4a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF ADULT RECREATIONAL USERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adult Recreational User
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.4E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.6E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.4E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.2E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.6E-10
	(total)										4.6E-10
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	8.0E-10	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.7E-10	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.5E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.6E-10	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	8.4E-11
	(total)										8.4E-11
										Total Risk Across All Exposure Routes/Pathways	**5.5E-10**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.5

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	100	USEPA, May 1993	50	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	52	Professional Judgement	26	Professional Judgement	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	10	Professional Judgement	10	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	43	USEPA, December 1989	43	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	3,650	USEPA, December 1989	3,650	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.3	USEPA, September 2001	0.04	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	3,263	USEPA, August 1997	3,263	USEPA, August 1997	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	52	Professional Judgement	26	Professional Judgement	
	ED	Exposure Duration	(years)	10	Professional Judgement	10	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	43	USEPA, August 1997	43	USEPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	3,650	USEPA, December 1989	3,650	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	4.73E-08	Cancer Ingestion Intake - CTE	1.18E-08
Noncancer Ingestion Intake - RME	3.31E-07	Noncancer Ingestion Intake - CTE	8.28E-08
Cancer Dermal Intake - RME	4.63E-07	Cancer Dermal Intake - CTE	3.09E-08
Noncancer Dermal Intake - RME	3.24E-06	Noncancer Dermal Intake - CTE	2.16E-07

TABLE 7.5. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.3E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.3E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.2E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.3E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.6E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.0E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	(total)												2.0E-02
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.2E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.0E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.3E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	4.5E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	6.8E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.3E-04
	(total)												1.9E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**3.9E-02**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.5. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.3E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.9E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										1.1E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.0E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.2E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.7E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										1.1E-08
										Total Risk Across All Exposure Routes/Pathways	**2.2E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.5a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.8E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.0E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.8E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	5.8E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.2E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.7E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	5.8E-05
	(total)												4.9E-03
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.9E-04
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	4.7E-04
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.5E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	3.0E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.5E-08	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.5E-05
	(total)												1.3E-03
												Total Hazard Index Across All Exposure Routes/Pathways	**6.2E-03**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.5a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF ADOLESCENT TRESPASSERS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.6E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.5E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	8.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.5E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.7E-09
	(total)										2.7E-09
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	6.8E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.0E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.1E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	6.5E-09	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-10
	(total)										7.1E-10
										Total Risk Across All Exposure Routes/Pathways	**3.4E-09**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.6

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF DAY CARE CENTER CHILDREN TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	200	USEPA, May 1993	100	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	250	USEPA, May 1993	219	USEPA, May 1993	BW x AT x CF
	FI	Fraction Ingested	(unitless)	0.5	Professional Judgement	0.5	Professional Judgement	
	ED	Exposure Duration	(years)	6	Professional Judgement	3	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	15	USEPA, December 1989	15	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2,190	USEPA, December 1989	1,095	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.3	USEPA, September 2001	0.04	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	2,800	USEPA, September 2001	2,800	USEPA, September 2001	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	250	USEPA, May 1993	219	USEPA, May 1993	
	ED	Exposure Duration	(years)	6	Professional Judgement	3	Professional Judgement	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	15	USEPA, August 1997	15	USEPA, August 1997	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2,190	USEPA, December 1989	1,095	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	3.91E-07	Cancer Ingestion Intake - CTE	8.57E-08
Noncancer Ingestion Intake - RME	4.57E-06	Noncancer Ingestion Intake - CTE	2.00E-06
Cancer Dermal Intake - RME	3.29E-06	Cancer Dermal Intake - CTE	1.92E-07
Noncancer Dermal Intake - RME	3.84E-05	Noncancer Dermal Intake - CTE	4.48E-06

TABLE 7.6. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF DAY CARE CENTER CHILDREN TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-05	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.7E-01
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.9E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	9.9E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.2E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	6.3E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.6E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.2E-03
	(total)												2.7E-01
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	8.4E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.4E-01
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.0E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	8.3E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.7E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	5.3E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	8.1E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.7E-03
	(total)												2.3E-01
												Total Hazard Index Across All Exposure Routes/Pathways	**5.0E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.6. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF DAY CARE CENTER CHILDREN TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	8.6E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.1E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.7E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	8.2E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	9.0E-08
	(total)										9.0E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.2E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.3E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.3E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	6.9E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.6E-08
	(total)										7.6E-08
										Total Risk Across All Exposure Routes/Pathways	**1.7E-07**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.6a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF DAY CARE CENTER CHILDREN TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.4E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.3E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.6E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	4.3E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.4E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	2.8E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.2E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	1.4E-03
	(total)												1.2E-01
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	9.9E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.6E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.8E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	9.7E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.1E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	6.2E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.4E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.1E-04
	(total)												2.7E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**1.4E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.6a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF DAY CARE CENTER CHILDREN TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Adolescent Trespasser
Receptor Age: 7-16 Years

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.9E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.1E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	6.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.8E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.0E-08
	(total)										2.0E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.2E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.5E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.3E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	4.0E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.4E-09
	(total)										4.4E-09
										Total Risk Across All Exposure Routes/Pathways	**2.4E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.7

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	100	USEPA, May 1993	50	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	350	USEPA, May 1993	234	USEPA, May 1993	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	24	USEPA, May 1993	7	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8,760	USEPA, December 1989	2,555	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.07	USEPA, September 2001	0.01	USEPA, September 2001	Cs x SA x ABS x AF x EF x ED
	SA	Skin Surface Area	(cm^2)	5,700	USEPA, September 2001	5,700	USEPA, September 2001	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical-specific	USEPA, September 2001	chemical-specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	350	USEPA, May 1993	234	USEPA, May 1993	
	ED	Exposure Duration	(years)	24	USEPA, May 1993	7	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	70	USEPA, December 1989	70	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	8,760	USEPA, December 1989	2,555	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	4.70E-07	Cancer Ingestion Intake - CTE	4.58E-08
Noncancer Ingestion Intake - RME	1.37E-06	Noncancer Ingestion Intake - CTE	4.58E-07
Cancer Dermal Intake - RME	1.87E-06	Cancer Dermal Intake - CTE	5.22E-08
Noncancer Dermal Intake - RME	5.47E-06	Noncancer Dermal Intake - CTE	5.22E-07

TABLE 7.7. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	3.0E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	5.0E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.8E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	3.0E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	9.5E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.9E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.9E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	9.6E-04
	(total)												8.1E-02
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.2E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.0E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	7.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.2E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.8E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	7.6E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.1E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.8E-04
	(total)												3.2E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**1.1E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.7. REASONABLE MAXIMUIM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.1E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.3E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.9E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-07
	(total)										1.1E-07
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	4.1E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	2.4E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	1.3E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	3.9E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	4.3E-08
	(total)										4.3E-08
										Total Risk Across All Exposure Routes/Pathways	**1.5E-07**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.7a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.7E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.0E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	9.9E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.2E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	6.4E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.6E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.2E-04
	(total)												2.7E-02
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.1E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.9E-03
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.8E-08	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.1E-03
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.6E-07	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	7.3E-06
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.1E-07	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.7E-05
	(total)												3.1E-03
												Total Hazard Index Across All Exposure Routes/Pathways	**3.0E-02**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.7a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF FUTURE ADULT RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.0E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.2E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.6E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.1E-08
	(total)										1.1E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.1E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.8E-09	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.6E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.1E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	1.2E-09
	(total)										1.2E-09
										Total Risk Across All Exposure Routes/Pathways	**1.2E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 4.8

VALUES USED FOR DAILY INTAKE CALCULATIONS
EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CTE Value	CTE Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	IRs	Ingestion Rate of Soil	(mg/day)	200	USEPA, May 1993	100	USEPA, May 1993	Cs x IRs x EF x ED
	EF	Exposure Frequency	(days/year)	350	USEPA, May 1993	234	USEPA, May 1993	BW x AT x CF
	FI	Fraction Ingested	(unitless)	1	Professional Judgement	1	Professional Judgement	
	ED	Exposure Duration	(years)	6	USEPA, May 1993	2	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	15	USEPA, December 1989	15	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2,190	USEPA, December 1989	730	USEPA, December 1989	
Dermal	Cs	Chemical Concentration in Soil	(mg/kg)	Maximum	USEPA, May 1993	Maximum	USEPA, May 1993	Chronic Daily Intake (CDI) (mg/kg-day) =
	AF	Soil to Skin Adherence Factor	(mg/cm^2)	0.2	USEPA, September 2001	0.04	USEPA, September 2001	Cs x SA x ABS x Af x EF x ED
	SA	Skin Surface Area	(cm^2)	2,800	USEPA, September 2001	2,800	USEPA, September 2001	BW x AT x CF
	ABS	Absorption Factor	(unitless)	chemical specific	USEPA, September 2001	chemical specific	USEPA, September 2001	
	EF	Exposure Frequency	(days/year)	350	USEPA, May 1993	234	USEPA, May 1993	
	ED	Exposure Duration	(years)	6	USEPA, May 1993	2	USEPA, May 1993	
	CF	Conversion Factor	(mg/kg)	1.0E-06	USEPA, December 1989	1.0E-06	USEPA, December 1989	
	BW	Body Weight	(kg)	15	USEPA, December 1989	15	USEPA, December 1989	
	AT-C	Averaging Time (Cancer)	(days)	25,550	USEPA, December 1989	25,550	USEPA, December 1989	
	AT-N	Averaging Time (Noncancer)	(days)	2,190	USEPA, December 1989	730	USEPA, December 1989	

Daily Intake Calculations

Ingestion Intake = (IR x Fi x EF x ED x CF) / (BW x AT)
Dermal Intake = (CF x SA x AF x ABS x EF x ED) / (BW x AT)

Cancer Ingestion Intake - RME	1.10E-06	Cancer Ingestion Intake - CTE	1.22E-07
Noncancer Ingestion Intake - RME	1.28E-05	Noncancer Ingestion Intake - CTE	4.27E-06
Cancer Dermal Intake - RME	3.07E-06	Cancer Dermal Intake - CTE	1.37E-07
Noncancer Dermal Intake - RME	3.58E-05	Noncancer Dermal Intake - CTE	4.79E-06

TABLE 7.8. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.8E-05	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	4.7E-01
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.7E-05	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	2.8E-01
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	8.9E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	1.8E-03
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.7E-05	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	8.9E-03
	(total)												7.6E-01
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	7.9E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.3E-01
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.7E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	7.8E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.5E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	5.0E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	7.5E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	2.5E-03
	(total)												2.1E-01
												Total Hazard Index Across All Exposure Routes/Pathways	**9.7E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.8. REASONABLE MAXIMUM EXPOSURE (RME)

CALCULATION OF CANCER RISKS
EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.4E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.4E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	7.6E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.3E-06	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.5E-07
	(total)										2.5E-07
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	6.8E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	4.0E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	2.1E-06	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	6.4E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	7.1E-08
	(total)										7.1E-08
										Total Risk Across All Exposure Routes/Pathways	**3.2E-07**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 7.8a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF NON-CANCER HAZARDS
EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	9.4E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.6E-01
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	5.6E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	9.3E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.0E-05	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	5.9E-04
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	9.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.0E-03
	(total)												2.5E-01
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	1.1E-06	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.8E-02
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	6.2E-07	mg/kg-day	6.00E-05	mg/kg-day	NA	NA	1.0E-02
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	3.3E-06	mg/kg-day	5.00E-02	mg/kg-day	NA	NA	6.7E-05
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	1.0E-06	mg/kg-day	3.00E-03	mg/kg-day	NA	NA	3.4E-04
	(total)												2.8E-02
												Total Hazard Index Across All Exposure Routes/Pathways	**2.8E-01**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 8.8a. CENTRAL TENDENCY EXPOSURE (CTE)

CALCULATION OF CANCER RISKS
EXPOSURE OF FUTURE CHILD RESIDENTS TO SURFACE SOIL
SITE 7 - ORDNANCE BURN AREA
NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil
Exposure Point: Surface Soil
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	2.7E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.6E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	8.5E-07	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.6E-07	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	2.8E-08
	(total)										2.8E-08
Dermal	2-Amino-4,6-dinitrotoluene	2.20E+00	mg/kg	2.20E+00	mg/kg	M	3.0E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	4-Amino-4,6-dinitrotoluene	1.30E+00	mg/kg	1.30E+00	mg/kg	M	1.8E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	HMX	6.95E+00	mg/kg	6.95E+00	mg/kg	M	9.5E-08	mg/kg-day	NA	$(mg/kg\text{-}day)^{-1}$	
	RDX	2.10E+00	mg/kg	2.10E+00	mg/kg	M	2.9E-08	mg/kg-day	1.10E-01	$(mg/kg\text{-}day)^{-1}$	3.2E-09
	(total)										3.2E-09
										Total Risk Across All Exposure Routes/Pathways	**3.1E-08**

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

Dermal Absorption Fraction (ABS)(USEPA, September, 2001):

Semivolatiles - 0.1

TABLE 9.1. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FULL TIME WORKER
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Full Time Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.6E-02		2.4E-02	6.0E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	2.1E-02		1.4E-02	3.5E-02
			HMX					HMX	Liver, Blood	1.4E-04		9.0E-05	2.3E-04
			RDX	8.1E-08		5.3E-08	1.3E-07	RDX	Prostate	6.8E-04		4.5E-04	1.1E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.3E-07		Total Hazard Index Across All Media and All Exposure Routes				9.6E-02

Total Risk Across All Media and All Exposure Routes: 1.3E-07

Total Liver HI = 9.5E-02
Total Prostate HI = 1.1E-03
Total Blood HI = 2.3E-04

TABLE 9.2. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE / UTILITY WORKER
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.2E-02		1.2E-02	2.4E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	7.2E-03		7.0E-03	1.4E-02
			HMX					HMX	Liver, Blood	4.6E-05		4.5E-05	9.1E-05
			RDX	1.1E-08		1.1E-08	2.2E-08	RDX	Prostate	2.3E-04		2.3E-04	4.6E-04
			Total Risk for Ingstion and Dermal Contact with Surface Soil				2.2E-08	Total Hazard Index Across All Media and All Exposure Routes					3.9E-02

Total Risk Across All Media and All Exposure Routes: 2.2E-08

Total Liver HI = 3.8E-02
Total Prostate HI = 4.6E-04
Total Blood HI = 9.1E-05

TABLE 9.3. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION WORKER
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.2E-01		2.6E-02	1.5E-01
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	7.3E-02		1.5E-02	8.8E-02
			HMX					HMX	Liver, Blood	4.7E-04		9.7E-05	5.7E-04
			RDX	1.1E-08		2.3E-09	1.3E-08	RDX	Prostate	2.4E-03		4.9E-04	2.9E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.3E-08		Total Hazard Index Across All Media and All Exposure Routes				2.4E-01

Total Risk Across All Media and All Exposure Routes	1.3E-08

Total Liver HI =	2.4E-01
Total Prostate HI =	2.9E-03
Total Blood HI =	5.7E-04

TABLE 9.4. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USER
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recrational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	2.3E-03		1.7E-03	3.9E-03
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	1.4E-03		9.8E-04	2.3E-03
			HMX					HMX	Liver, Blood	8.7E-06		6.3E-06	1.5E-05
			RDX	6.2E-09		4.5E-09	1.1E-08	RDX	Prostate	4.4E-05		3.2E-05	7.5E-05
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.1E-08	Total Hazard Index Across All Media and All Exposure Routes					6.4E-03

Total Risk Across All Media and All Exposure Routes	1.1E-08

Total Liver HI =	6.3E-03
Total Prostate HI =	7.5E-05
Total Blood HI =	1.5E-05

TABLE 9.5. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADOLESCENT TRESPASSER
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.2E-02		1.2E-02	2.4E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	7.2E-03		7.0E-03	1.4E-02
			HMX					HMX	Liver, Blood	4.6E-05		4.5E-05	9.1E-05
			RDX	1.1E-08		1.1E-08	2.2E-08	RDX	Prostate	2.3E-04		2.3E-04	4.6E-04
			Total Risk for Ingstion and Dermal Contact with Surface Soil				2.2E-08		Total Hazard Index Across All Media and All Exposure Routes				3.9E-02

Total Risk Across All Media and All Exposure Routes: 2.2E-08

Total Liver HI = 3.8E-02
Total Prostate HI = 4.6E-04
Total Blood HI = 9.1E-05

TABLE 9.6. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - DAY CARE CENTER CHILDREN
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Day Care Center Child
Receptor Age: Child (0-6 Years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.7E-01		1.4E-01	3.1E-01
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	9.9E-02		8.3E-02	1.8E-01
			HMX					HMX	Liver, Blood	6.3E-04		5.3E-04	1.2E-03
			RDX	9.0E-08		7.6E-08	1.7E-07	RDX	Prostate	3.2E-03		2.7E-03	5.9E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.7E-07		Total Hazard Index Across All Media and All Exposure Routes				5.0E-01

Total Risk Across All Media and All Exposure Routes 1.7E-07

Total Liver HI = 4.9E-01
Total Prostate HI = 5.9E-03
Total Blood HI = 1.2E-03

TABLE 9.7. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	5.0E-02		2.0E-02	7.0E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	3.0E-02		1.2E-02	4.2E-02
			HMX					HMX	Liver, Blood	1.9E-04		7.6E-05	2.7E-04
			RDX	1.1E-07		4.3E-08	1.5E-07	RDX	Prostate	9.6E-04		3.8E-04	1.3E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.5E-07		Total Hazard Index Across All Media and All Exposure Routes				1.1E-01

Total Risk Across All Media and All Exposure Routes	1.5E-07

Total Liver HI =	1.1E-01
Total Prostate HI =	1.3E-03
Total Blood HI =	2.7E-04

TABLE 9.8. REASONABLE MAXIMUM EXPOSURE (RME)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SITE 7 - ORDNANCE BURN AREA
FORMER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	4.7E-01		1.3E-01	6.0E-01
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	2.8E-01		7.8E-02	3.5E-01
			HMX					HMX	Liver, Blood	1.8E-03		5.0E-04	2.3E-03
			RDX	2.5E-07		7.1E-08	3.2E-07	RDX	Prostate	8.9E-03		2.5E-03	1.1E-02
			Total Risk for Ingstion and Dermal Contact with Surface Soil				3.2E-07	Total Hazard Index Across All Media and All Exposure Routes					9.7E-01

Total Risk Across All Media and All Exposure Routes: 3.2E-07

Total Liver HI = 9.6E-01
Total Prostate HI = 1.1E-02
Total Blood HI = 2.3E-03

TABLE 9.1a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FULL TIME WORKER
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Full Time Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.6E-02		2.1E-03	1.8E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	9.3E-03		1.2E-03	1.1E-02
			HMX					HMX	Liver, Blood	6.0E-05		7.9E-06	6.7E-05
			RDX	1.3E-08		1.7E-09	1.4E-08	RDX	Prostate	3.0E-04		4.0E-05	3.4E-04
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.4E-08		Total Hazard Index Across All Media and All Exposure Routes				2.9E-02

Total Risk Across All Media and All Exposure Routes: 1.4E-08

Total Liver HI = 2.8E-02
Total Prostate HI = 3.4E-04
Total Blood HI = 6.7E-05

TABLE 9.2a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - MAINTENANCE / UTILITY WORKER
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Maintenance / Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.0E-03		7.9E-04	3.8E-03
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	1.8E-03		4.7E-04	2.3E-03
			HMX					HMX	Liver, Blood	1.2E-05		3.0E-06	1.5E-05
			RDX	2.7E-09		7.1E-10	3.4E-09	RDX	Prostate	5.8E-05		1.5E-05	7.3E-05
			Total Risk for Ingstion and Dermal Contact with Surface Soil				3.4E-09		Total Hazard Index Across All Media and All Exposure Routes				6.2E-03

Total Risk Across All Media and All Exposure Routes: 3.4E-09

Total Liver HI = 6.1E-03
Total Prostate HI = 7.3E-05
Total Blood HI = 1.5E-05

TABLE 9.3a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - CONSTRUCTION WORKER
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	6.2E-02		8.5E-03	7.1E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	3.7E-02		5.0E-03	4.2E-02
			HMX					HMX	Liver, Blood	2.4E-04		3.2E-05	2.7E-04
			RDX	5.6E-09		7.7E-10	6.3E-09	RDX	Prostate	1.2E-03		1.6E-04	1.3E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				6.3E-09		Total Hazard Index Across All Media and All Exposure Routes				1.1E-01

Total Risk Across All Media and All Exposure Routes: 6.3E-09

Total Liver HI = 1.1E-01
Total Prostate HI = 1.3E-03
Total Blood HI = 2.7E-04

TABLE 9.4a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADULT RECREATIONAL USER
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Recrational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	5.7E-04		1.0E-04	6.8E-04
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	3.4E-04		6.1E-05	4.0E-04
			HMX					HMX	Liver, Blood	2.2E-06		3.9E-07	2.6E-06
			RDX	4.6E-10		8.4E-11	5.5E-10	RDX	Prostate	1.1E-05		2.0E-06	1.3E-05
			Total Risk for Ingstion and Dermal Contact with Surface Soil				5.5E-10		Total Hazard Index Across All Media and All Exposure Routes				1.1E-03

Total Risk Across All Media and All Exposure Routes: 5.5E-10

Total Liver HI = 1.1E-03
Total Prostate HI = 1.3E-05
Total Blood HI = 2.6E-06

TABLE 9.5a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - ADOLESCENT TRESPASSER
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	3.0E-03		7.9E-04	3.8E-03
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	1.8E-03		4.7E-04	2.3E-03
			HMX					HMX	Liver, Blood	1.2E-05		3.0E-06	1.5E-05
			RDX	2.7E-09		7.1E-10	3.4E-09	RDX	Prostate	5.8E-05		1.5E-05	7.3E-05
			Total Risk for Ingstion and Dermal Contact with Surface Soil				3.4E-09	Total Hazard Index Across All Media and All Exposure Routes					6.2E-03

Total Risk Across All Media and All Exposure Routes: 3.4E-09

Total Liver HI = 6.1E-03
Total Prostate HI = 7.3E-05
Total Blood HI = 1.5E-05

TABLE 9.6a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - DAY CARE CENTER CHILDREN
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Day Care Center Child
Receptor Age: Child (0-6 Years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	7.3E-02		1.6E-02	9.0E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	4.3E-02		9.7E-03	5.3E-02
			HMX					HMX	Liver, Blood	2.8E-04		6.2E-05	3.4E-04
			RDX	2.0E-08		4.4E-09	2.4E-08	RDX	Prostate	1.4E-03		3.1E-04	1.7E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				2.4E-08		Total Hazard Index Across All Media and All Exposure Routes				1.4E-01

Total Risk Across All Media and All Exposure Routes	2.4E-08

Total Liver HI =	1.4E-01
Total Prostate HI =	1.7E-03
Total Blood HI =	3.4E-04

TABLE 9.7a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE ADULT RESIDENT
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.7E-02		1.9E-03	1.9E-02
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	9.9E-03		1.1E-03	1.1E-02
			HMX					HMX	Liver, Blood	6.4E-05		7.3E-06	7.1E-05
			RDX	1.1E-08		1.2E-09	1.2E-08	RDX	Prostate	3.2E-04		3.7E-05	3.6E-04
			Total Risk for Ingstion and Dermal Contact with Surface Soil				1.2E-08		Total Hazard Index Across All Media and All Exposure Routes				3.0E-02

Total Risk Across All Media and All Exposure Routes: 1.2E-08

Total Liver HI = 3.0E-02
Total Prostate HI = 3.6E-04
Total Blood HI = 7.1E-05

TABLE 9.8a. CENTRAL TENDENCY EXPOSURE (CTE)
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs - FUTURE CHILD RESIDENT
SITE 7 - ORDNANCE BURN AREA
FOCTER NSWC-WHITE OAK, SILVER SPRING, MARYLAND

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child (0-6 Years)

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Entire Site	2-Amino-4,6-dinitrotoluene					2-Amino-4,6-dinitrotoluene	Liver	1.6E-01		1.8E-02	1.7E-01
			4-Amino-4,6-dinitrotoluene					4-Amino-4,6-dinitrotoluene	Liver	9.3E-02		1.0E-02	1.0E-01
			HMX					HMX	Liver, Blood	5.9E-04		6.7E-05	6.6E-04
			RDX	2.8E-08		3.2E-09	3.1E-08	RDX	Prostate	3.0E-03		3.4E-04	3.3E-03
			Total Risk for Ingstion and Dermal Contact with Surface Soil				3.1E-08		Total Hazard Index Across All Media and All Exposure Routes				2.8E-01

Total Risk Across All Media and All Exposure Routes: 3.1E-08

Total Liver HI = 2.8E-01
Total Prostate HI = 3.3E-03
Total Blood HI = 6.6E-04

APPENDIX E

SOIL TO GROUNDWATER MODELING

TECHNICAL MEMORANDUM

SITE 7—ORDNANCE BURN AREA
FORMER NSWC WHITE OAK
SILVER SPRING, MARYLAND

USE OF RBCs AS PRGs

The draft Corrective Measures Study (CMS) proposed using the EPA Region 3 Residential Soil Risk-Based Concentrations (RBCs) as the Preliminary Remediation Goal (PRG) for soil at Site 7. It was concluded, based on the results of the RCRA Facility Investigation (RFI) and the CMS, that removal of all soil with concentrations greater than RBC would result in protection of public health and the environment and would also be protective of the underlying groundwater.

EPA's primary concern with use of the RBC is that the value is considered to be a screening level. As such, its basis for derivation is solely predicated by exposure through ingestion, thus failing to consider exposure through dermal contact and inhalation. Hence, consideration of these pathways would suggest that the PRG would be lower and that the RBC would fail to be adequately protective of human health.

Tetra Tech NUS, Inc. and the U.S. Navy agree that the RBC only considers exposure through ingestion, but removal of all soil with constituent concentrations in excess of their respective RBCs would result in exposure concentrations less than the RBCs. Removal of this soil and replacement of these soils with clean fill would result in maximum detected concentrations of these concentrations less than the RBCs, thus indicating that they would not be retained in any risk assessment. Overall, removal of soils with constituent concentrations in excess of the RBCs may be more than necessary to achieve an acceptable risk level or hazard index.

Appendix B of the draft CMS for Site 7 presented data, assumptions, and general approach that was used to evaluate the potential risk to groundwater quality based on leaching and subsurface transport of explosives to the water-table aquifer. The vadose zone model ECTran, developed by TtNUS, was used to perform the soil-to-groundwater modeling. The results of the modeling, including sensitivity analyses, showed that current concentrations of explosive contaminants in the soil were not sufficient to cause an impact to groundwater quality. Comments on the modeling work stated that because the ECTran model is not an officially-approved USEPA model, another model or standard calculation of a soil screening level (SSL) should be used to develop PRGs for Site 7. This memo presents the calculations of remediation goals using two different methods and then compares these remediation goals to actual soil concentrations detected at the site.

Attachment 1 shows the calculation of remediation goals using the standard method suggested by the USEPA. The K_{oc} values and physical soil properties used to compute the SSLs are also listed in Attachment 1. The dilution attenuation factor (DAF) equal to 24.9 was used to perform these calculations. The calculation of the DAF is shown on Attachment 2 and repeated on Attachments 3 and 4. The calculated SSLs listed on Attachment 1 are below the maximum concentrations detected in the soils at Site 7. The calculated SSL values for RDX, TNT, and ADNT compounds were exceeded in the samples collected as part of the RFI conducted by Tetra Tech NUS, Inc. in 1999 and 2000 (Attachment 5) and as part of the Remedial Investigation conducted by Malcolm Pirnie in the early 1990's.

Remediation goals were also computed using an alternative method, the Mass Limit Model or Summers model. Calculations using this method are shown on Attachments 2, 3, and 4 for RDX, TNT, and ADNT compounds, respectively. Again, the assumed parameter values and a DAF of 24.9 used for these calculations are listed in the attachments. The resulting remediation goals calculated using this method are also listed in Attachment 5. The remediation goals derived from the Summers model are greater than those calculated using the standard approach (Attachment 1). The Summers model remediation goals are greater

and much closer to the maximum concentrations detected in the soils. However, using the different remediation goal did not significantly effect the amount of soil with concentrations greater than the remediation goals.

Both of these remediation goal calculation procedures were intended to provide a means of identifying COPCs and screening data to be protective of groundwater quality. However, they are very conservative and were not intended to be used as a means to develop remedial action limits for site cleanup. If the thickness of the vadose zone (approximately 45 feet thick), the moderate to large soil adsorption coefficients (K_ds), and the moderate biodegradation rates are considered in the potential impact analysis (as was done in Appendix B of the draft CMS), then the soil concentration limits that are protective of groundwater would be much greater (at least one order of magnitude) than the SSLs presented in Attachment 5. Consequently, removal of soil with constituent concentrations greater than their respective RBCs would result in protection of groundwater, as well as protection of human health..

Attachment 1 -- Calculation of SSLs for Protection of Groundwater

SSL = Cw * [Kd + (qw + qa * H')/pb] = Cw * [(Koc * foc) + (qw + qa * H')/pb]

Cw = target leachate concentration = allowable groundwater concentration * DAF
Kd = soil-water partition coefficient = foc * Koc
foc = fraction organic matter in soil = 0.002 (default)
Koc = organic carbon - water partition coefficient
qw = water-filled soil porosity = 0.3 (default)
qa = air-filled soil porosity = 0.13 (default)
pb = dry bulk density = 1.7 g/cm3
H' = Henry's Law Constant
DAF = 24.9

SSL Calculation for RDX — SSL = 0.255 mg/kg

Cw = 0.0061 * 24.9 =	0.152
Koc = 750	
Kd = 750 * 0.002 =	1.50
H' =	1.20E-05

SSL Calculation for TNT — SSL = 3.383 mg/kg

Cw = 0.022 * 24.9 =	0.548
Koc = 3000	
Kd = 3000 * 0.002 =	6.00
H' =	4.87E-09

SSL Calculation for 2ADNT = 4ADNT — SSL = 0.207 mg/kg

Cw = 0.0022 * 24.9 =	0.055
Koc = 1800	
Kd = 1800 * 0.002 =	3.60
H' =	3.00E-03

Attachment 2 -- Calculation of Mass Limit Model Screening Level for RDX

Dilution/Attenuation Factor Calculations		Units
Infiltration Rate, I =	10	inches/year
Infiltration Rate, I =	0.833333	ft/year
Width of contaminated soil area, perpendicular to flow =	340	feet
Length of contaminated soil area parallel to flow =	60	feet
Contaminated Soil Area =	20,400	ft2
Downward Seepage through Contaminated Soil, Qp =	17,000	ft3/year
Saturated Aquifer Thickness =	20	feet
Aquifer Cross Sectional Area Perpendicular to Flow =	6,800	ft2
Hydraulic Gradient =	0.025	ft/ft
Horizontal Hydraulic Conductivity =	6.55	ft/day
Horizontal Hydraulic Conductivity =	2,391	ft/year
Flow through the Aquifer from Upgradient, Qa =	406,428	ft3/year
Dilution/Attenuation Factor (DAF) = (Qa+Qp)/Qp =	24.9	unitless

Mass Limit Model for RDX		
Infiltration Rate, I =	0.833	ft/year
Exposure Duration, ED =	70	years
Soil Bulk Density, pb =	1.7	g/cm3
Source Depth, ds =	1.5	feet
Maximum Allowable Groundwater Concentration =	0.0061	mg/L
Maximum Allowable Soil Water Concentration, Cp =	0.1519	mg/L
Allowable Soil Concentration, Cs = (Cp * I * ED)/ (pb * ds) =	**3.48**	mg/kg
Maximum Concentration Detected in Soil =	42.0	mg/kg

Attachment 3 -- Calculation of Mass Limit Model Screening Level for TNT

Dilution/Attenuation Factor Calculations		Units
Infiltration Rate, I =	10	inches/year
Infiltration Rate, I =	0.833333	ft/year
Width of contaminated soil area, perpendicular to flow =	340	feet
Length of contaminated soil area parallel to flow =	60	feet
Contaminated Soil Area =	20,400	ft2
Downward Seepage through Contaminated Soil, Qp =	17,000	ft3/year
Saturated Aquifer Thickness =	20	feet
Aquifer Cross Sectional Area Perpendicular to Flow =	6,800	ft2
Hydraulic Gradient =	0.025	ft/ft
Horizontal Hydraulic Conductivity =	6.55	ft/day
Horizontal Hydraulic Conductivity =	2,391	ft/year
Flow through the Aquifer from Upgradient, Qa =	406,428	ft3/year
Dilution/Attenuation Factor (DAF) = (Qa+Qp)/Qp =	24.9	unitless

Mass Limit Model for TNT		
Infiltration Rate, I =	0.833	ft/year
Exposure Duration, ED =	70	years
Soil Bulk Density, pb =	1.7	g/cm3
Source Depth, ds =	1.5	feet
Maximum Allowable Groundwater Concentration =	0.0220	mg/L
Maximum Allowable Soil Water Concentration, Cp =	0.5480	mg/L
Allowable Soil Concentration, Cs = (Cp * I * ED)/ (pb * ds) =	**12.54**	mg/kg
Maximum Concentration Detected in Soil =	14.0	mg/kg

Attachment 4 -- Calculation of Mass Limit Model Screening Level for 2ADNT and 4ADNT (combined)

Dilution/Attenuation Factor Calculations		Units
Infiltration Rate, I =	10	inches/year
Infiltration Rate, I =	0.833333	ft/year
Width of contaminated soil area, perpendicular to flow =	340	feet
Length of contaminated soil area parallel to flow =	60	feet
Contaminated Soil Area =	20,400	ft2
Downward Seepage through Contaminated Soil, Qp =	17,000	ft3/year
Saturated Aquifer Thickness =	20	feet
Aquifer Cross Sectional Area Perpendicular to Flow =	6,800	ft2
Hydraulic Gradient =	0.025	ft/ft
Horizontal Hydraulic Conductivity =	6.55	ft/day
Horizontal Hydraulic Conductivity =	2,391	ft/year
Flow through the Aquifer from Upgradient, Qa =	406,428	ft3/year
Dilution/Attenuation Factor (DAF) = (Qa+Qp)/Qp =	24.9	unitless

Mass Limit Model for 2ADNT + 4ADNT		
Infiltration Rate, I =	0.833	ft/year
Exposure Duration, ED =	70	years
Soil Bulk Density, pb =	1.7	g/cm3
Source Depth, ds =	1.5	feet
Maximum Allowable Groundwater Concentration =	0.0022	mg/L
Maximum Allowable Soil Water Concentration, Cp =	0.0548	mg/L
Allowable Soil Concentration, Cs = (Cp * I * ED)/ (pb * ds) =	**1.25**	mg/kg
Maximum Concentration Detected in Soil =	8.6	mg/kg

Attachment 5 - Screening Model Comparison for Protection of Groundwater

Contaminant	Soil Screening Level (SSL) (mg/kg)	Mass Limit (Summers Model) Screening Level (mg/kg)	Maximum Concentration Detected in Soil Samples[a] (mg/kg)	Frequency of Soil Samples[a] Exceeding Standard Soil Screening Level	Frequency of Soil Samples[a] Exceeding Mass Limit Screening Level
RDX	0.255	3.48	42.0	3/13	2/13
TNT	3.383	12.54	14.0	2/13	2/13
2ADNT + 4ADNT	0.207	1.25	8.6	1/13	1/13

a Thirteen soil samples were collected from 0 to 4 feet below ground surface for RFI and included in this evaluation of soil-to-groundwater pathway.