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FINAL SOURCE RELEASE INVESTIGATION TECHNICAL MEMORANDUM FOR SITE 12 DISPOSAL SITE NEAR THE WATER TOWER CHEATHAM ANNEX FISC WILLIAMSBURG VA
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Final
Source Release Investigation Technical Memorandum

Site 12 – Disposal Site Near the Water Tower
Naval Weapons Station Yorktown, Cheatham Annex Site
Williamsburg, Virginia

INTRODUCTION

Site 12, Disposal Site Near the Water Tower (Site 12), is located just inside the Cheatham Annex (CAX) fenceline, to the east of Jones Pond and the historic water treatment plant (Figure 1-1). The site is approximately 0.25 acres in size and is bounded by railroad tracks and Penniman Road (State Road 641) to the east and a gravel patrol road to the west. The site initially was identified as a former surface disposal area for non-hazardous material including scrap metal (primarily automobile parts) and iron pipe (approximately 70 - 110 cubic feet of material) in the Initial Assessment Study (NEESA, 1984). Site 12 was also identified based upon an aerial photograph study, where a "small mound of dark-toned material" was identified in a 1995 aerial photograph (USEPA, 1998a). Currently, no waste or soil staining is apparent and the site consists of maintained turf grass significantly influenced by ballast from the near-by rail line.

In December 2001, the Naval Weapons Station (WPNSTA) Yorktown Partnering Team reached consensus for a No Further Action (NFA) decision pending the results of a limited field investigation of the site. During the December 2001 site visit, the team located the approximate area identified by previous studies and discussed the approach for the limited field investigation. In June 2002, the field investigation was conducted and included the collection of eight surface (0 to 6 inches below ground surface [bgs]) and eight subsurface (6 to 24 inches bgs) soil samples (Baker, 2002). Two soil samples were collected from each soil sample boring (0 to 6 and 6 to 24 inches bgs) using a five-point sample grid (four corners and one center point) in the region identified in previous studies (Figure 1-1). To evaluate the potential of rail line contributions to the site as agreed upon during the December 2001 site visit, three additional soil borings, with samples collected from 0 to 6 inches and 6 to 24 inches bgs, were collected from each soil sample boring from a location upgradient of the site, near the railroad tracks. Influences from the rail line were expected, as an evaluation of Site 12 topography and soils indicated that surface water flows down gradient from the railroad and ponds in the vicinity of the Site 12 boundary. All samples were analyzed and validated for full Target Compound List/Target Analyte List (TCL/TAL) parameters (Volatile Organic Chemicals [VOCs], Semivolatile Organic Chemicals [SVOCs], pesticides, polychlorinated biphenyls [PCBs], metals, and cyanide). The analytical data and field investigation information for this effort are included as Attachments A and B, respectively. The analysis of all samples for these parameters was an alteration to the original scope of work for the field investigation and was agreed upon by the WPNSTA Partnering Team during the February 2002 Partnering Meeting.

After initial review of the data and discussion in April, August, and December 2003, the WPNSTA Partnering Team agreed to assess the site in terms of a potential source release prior to conducting a formal ecological risk assessment (human health risks were determined to be acceptable, See Section 2.0). The Team agreed to examine the potential for a release from Site 12 surface and subsurface soils via comparisons of the June 2002 dataset to three relevant reference datasets: 1) upgradient samples collected concurrently with the Site 12 dataset, 2) base-wide background samples collected from CAX in the same soil group (Soil Group 3) as Site 12 (Baker,

2003), and 3) base-wide background samples collected near railroad tracks (Soil Groups 2 and 3) during the WPNSTA background investigation (Baker, 1995). It is noted that VOC data were not collected from the CAX background dataset and that subsurface soil rail line reference samples were not available from the WPNSTA background investigation. The following discussion presents an evaluation of the Site 12 data in relation to reference conditions in order to establish the potential for a historic release from Site 12 activities.

1.0 SOURCE RELEASE AND ECOLOGICAL EVALUATION METHODS

As an initial step, the range of detected chemical concentrations in each soil horizon was compared between Site 12 and each of the three reference datasets. Chemicals not detected in Site 12 media were not identified as those suggestive of a potential release following the approach outlined in the National Oil and Hazardous Substances Pollution Contingency Plan's (NCP) Hazard Ranking System (40 Code of Federal Regulations [CFR], Part 300, Appendix A). The Hazard Ranking System does not establish a release for measurements less than the contract required detection limit when a United States Environmental Protection Agency (USEPA) certified laboratory performs the analysis. As all samples were analyzed by a certified laboratory and validated by a third party, the exclusion of non-detected chemicals is considered reasonable and appropriate in accordance with 40 CFR 300, Appendix A. As a conservative measure, any chemical that was detected in Site 12 media above reference concentrations was evaluated, though the Hazard Ranking System does not recognize a release when any chemical is detected in concentrations less than three times an appropriate reference concentration.

Statistical evaluations were performed in accordance with USEPA and Navy guidance (USEPA, 2002a and NFESC, 2002) for those chemicals identified as potentially elevated over reference conditions. Statistical comparisons included descriptive summaries of each data set, tests of the mean of the distribution (two sample t-tests), and tests of the right tail of the distribution (slippage tests). When censoring of the datasets required (majority of samples non-detects), proportional statistics (two-sample test of proportions) were performed. The significance level α (the probability criteria for rejecting the null hypotheses that datasets were sampled from the same population), was set *a priori* at 0.05 for all tests.

Comparisons to established ecological screening benchmarks were made for those chemicals where statistical evaluations were not appropriate (due to heavy censoring) and for those chemicals determined to be elevated over reference conditions by statistical evaluation. Ecological screening values (USEPA 1995b) were obtained from USEPA Region III Biological Technical Assistance Group (BTAG). Where more than one final screening value was available for a specific chemical (e.g., soil flora and fauna), the lowest of these values was conservatively selected. If a BTAG value was not available for a given chemical or if the BTAG value was not toxicologically based, literature sources were consulted to obtain a screening value. Ingestion-based screening values were also derived for dietary exposures for those chemicals identified by the USEPA as potentially bioaccumulative (USEPA 2000).

1.1 Results and Discussion

Tables 1-1 and 1-2 present comparisons of Site 12 surface and subsurface soil concentrations to available reference concentrations. Site 12 detected concentrations of toluene, di-n-octylphthalate, and copper exceeded reference concentrations in surface soils while bis(2-ethylhexyl)phthalate, naphthalene, calcium, and copper exceeded reference concentrations in

subsurface soils. It is noted that with the exception of naphthalene, each of these chemicals was detected in samples collected upgradient of Site 12, though in lower concentrations.

Statistical comparisons to upgradient concentrations were performed for di-n-octylphthalate and copper in surface soils and bis(2-ethylhexyl)phthalate, calcium, and copper in subsurface soils (Table 1-3 and Figure 1-2). Though the smallest dataset, the upgradient reference dataset was considered most appropriate for statistical evaluation because the samples were collected from the same soil group at Site 12, because they were collected concurrently with the Site 12 samples (therefore sharing laboratory analysis and validation), and because they include influences common to both sites in terms of suspected rail line contributions and historic weathering. Statistical comparisons were not performed for either toluene or naphthalene, because detected concentrations were not measured in upgradient samples collected from the same depth horizon (e.g. toluene was detected in Site 12 surface soil and upgradient subsurface soil, but not in upgradient surface soil). Instead, the magnitude and significance of detected concentrations of toluene and naphthalene is discussed in relation to potential ecological impacts below.

The statistical evaluation of di-n-octylphthalate and copper in surface soils and bis(2-ethylhexyl)phthalate, calcium, and copper in subsurface soils demonstrates that these chemicals are present in Site 12 soils at concentrations equivalent to reference concentrations, indicating that the data do not support the conclusion that a release has occurred at the site (Table 1-3 and Figure 1-2). It is noted that tests of the mean of the distribution were not possible for either of the phthalate esters (di-n-octylphthalate and bis(2-ethylhexyl)phthalate) due to heave censoring in the datasets. Proportional statistics were appropriate and were performed for bis(2-ethylhexyl)phthalate, but only tests of the right tail of the distribution (slippage test) were possible for di-n-octylphthalate as reporting limits were an order of magnitude greater than detected concentrations. The determination of statistical equivalence for each of these chemicals was based on the statistical tests that were appropriate, as well as examination of the descriptive summaries of each chemical (including the range, mean, and 95% Upper Confidence Limit [95% UCL]). It is additionally noted that bis(2-ethylhexyl)phthalate was detected in three laboratory method blanks, resulting in "B" qualified sample results for the majority of Site 12 site and upgradient samples. This indicates that the presence of bis(2-ethylhexyl)phthalate is likely due to laboratory contamination and not to its actual occurrence in either the Site 12 or upgradient media.

Parametric two-sample t-test comparisons of copper in surface soils resulted in a probability level of 0.0544 (which is just above the significance threshold of 0.05), indicating a non-significant result. As an additional conservative measure to confirm the borderline statistical significance, a comparison to ecological screening values was performed to ensure that copper is not present in Site 12 media at ecologically significant concentrations. As copper is identified as a potentially bioaccumulative chemical (USEPA, 2000), these comparisons were to ingestion-based screening values protective of upper trophic level birds and mammals, as well as to benchmarks protective of lower trophic level terrestrial receptors. The maximum concentration of copper measured in Site 12 soils was 8.9 mg/kg. The lowest available surface soil screening value for copper is 50 mg/kg, a value derived from the results of twenty-four studies on earthworms, and therefore protective of terrestrial invertebrate populations (Efroymson et. al., 1997b). Screening values protective of terrestrial plants (100 mg/kg, Efroymson et. al., 1997a) and microorganisms (100 mg/kg, Efroymson et. al., 1997b) are also available. Comparisons to these values indicate that the potential for risk from copper to lower trophic level terrestrial receptors is acceptable, as the maximum detected concentration of copper in Site 12 soils is below these ecological benchmarks. Previous evaluations of potential upper trophic level exposures have shown that the short-tailed shrew is the most sensitive receptor to copper exposures, likely due to its insectivorous life-style

(Baker, 2004). As such, dietary exposures to the shrew were conservatively evaluated as a surrogate for all upper trophic level receptors. Comparison of a maximum exposure dose for the shrew (1.8 mg/kg body weight/day based on a maximum concentration of 8.9 mg/kg) to the corresponding No Observed Adverse Effects Level (NOAEL) ingestion-based screening value (11.7 mg/kg/day) also indicates an acceptable potential for ecological risk. There is no indication, therefore, that copper is present in Site 12 media at ecologically relevant concentrations.

Toluene was detected in one of the five Site 12 surface soil samples but was not detected in any surface soil reference samples. As described above, statistical comparisons were not appropriate given the large number of non-detected values in the dataset. It is noted that the toluene detection (1J µg/kg) was below reporting limit concentrations from the Site 12 and upgradient datasets (2B to 3B µg/kg) and that toluene was detected in each of the three upgradient subsurface soils collected (each sample concentration = 1J µg/kg). As described above for bis(2-ethylhexyl)phthalate, toluene was detected in two laboratory method blanks, resulting in "B" qualified sample results for the majority of Site 12 site and upgradient samples. This indicates that the presence of toluene is likely due to laboratory contamination and not to its actual occurrence in the samples collected. As an additional conservative measure, a comparison to ecological screening values was performed to ensure that toluene is not present in Site 12 media at ecologically significant concentrations. This comparison was limited to ecological benchmarks protective of lower trophic level receptors, as toluene is not identified by USEPA as a bioaccumulative chemical (USEPA, 2000). USEPA Region III BTAG recommends a screening value of 100 µg/kg, which is based on Canadian background concentrations (USEPA, 1995b). The only toxicologically based screening value identified in the literature for toluene is a terrestrial plant benchmark of 200,000 µg/kg, which is based on two studies with four plant species (Efroymson et. al., 1997a). Comparison of the site maximum concentration (1J µg/kg) to these values indicates that the potential for risk from toluene to lower trophic level terrestrial receptors is acceptable. Given the impact laboratory contamination on the dataset as well as comparisons to ecological benchmarks, there is no indication that toluene is present in Site 12 media at ecologically relevant concentrations.

The polynuclear aromatic hydrocarbon (PAH) naphthalene was detected in one of the five Site 12 subsurface soil samples at a concentration (33J µg/kg) that was an order of magnitude below reporting limits (370-380U µg/kg). This indicates that there is uncertainty in the conclusion that naphthalene is actually present in Site 12 media. Naphthalene was not detected in either surface or subsurface soils in any of the reference datasets, making statistical comparisons inappropriate. Given this limitation, a comparison to ecological screening values was performed to ensure that naphthalene is not present in Site 12 media at ecologically significant concentrations. This comparison was limited to ecological benchmarks protective of lower trophic level receptors, as naphthalene is not identified by USEPA as a bioaccumulative chemical (USEPA, 2000). USEPA Region III BTAG recommends a screening value protective of terrestrial plants and invertebrates of 100 µg/kg, which is based on Canadian background concentrations (USEPA, 1995b). Toxicological data are available for the PAH benzo(a)pyrene, which is often considered to be the most toxic of the PAH compounds. Van Staalen and Verweij (1991) examined the effects of the benzo(a)pyrene on the wood louse (*Porcellio scaber*). They calculated a chronic (28-day) NOAEL for growth of 25,000 µg/kg. Sims and Overcash (1983) investigated the chronic toxicity of benzo(b)fluoranthene and benzo(a)pyrene to wheat. A chronic NOAEL of 1,200 µg/kg was reported for both PAHs. Comparisons to these values indicate that the potential for risk from naphthalene to lower trophic level terrestrial receptors is acceptable, as the maximum detected concentration of naphthalene in Site 12 subsurface soils is far below any of these ecological benchmarks.

1.2 Conclusions and Recommendations

The results of this evaluation do not support the conclusion that either a source release has occurred at Site 12 or that chemicals detected in Site 12 soil media are present in ecologically relevant concentrations. Instead, the data indicate that chemicals detected within Site 12 soil media are either consistent with concentrations found in reference conditions or are below benchmark concentrations protective of terrestrial ecological receptors. In addition, examination of the laboratory and validation analysis indicates the presence of certain organic compounds is more likely due to laboratory contamination than to Site 12 influences. In summary, the data support a recommendation of No Further Action at Site 12.

2.0 HUMAN HEALTH RISK ASSESSMENT

A baseline human health risk assessment (HHRA) was performed to evaluate the potential risks associated with exposure to environmental media at Site 12 - Disposal Site Near the Water Tower if remedial action is not undertaken. The baseline HHRA considers the most likely routes of potential human exposure for both current and future risk scenarios. The baseline HHRA was conducted in accordance with the Risk Assessment Guidance for Superfund (RAGS), Part A, Human Health Evaluation Manual (United States Environmental Protection Agency [USEPA], 1989), and the most recent updates, including the reporting format as set forth in RAGS Part D (USEPA, 1998b). The complete set of RAGS Part D Tables is presented in Attachment C.

The baseline HHRA is comprised of seven sections; Section 2.1 presents the selection of Chemicals of Potential Concern (COPCs). Sections 2.2 and 2.3 present the Exposure Assessment and Toxicity Assessment, respectively. The Risk Characterization is presented in Section 2.4. Section 2.5 presents sources of uncertainty inherent in the estimation of inferential potential human health effects. Summary and conclusion of the baseline HHRA is provided in Section 2.6. Section 3.0 presents the references.

2.1 Identification of Chemicals of Potential Concern

The selection of COPCs was based on the information provided in the USEPA Region III Technical Guidance on *Selecting Exposure Routes and Contaminants of Concern, by Risk-Based Screening*, dated January 1993 (USEPA, 1993) and USEPA's *Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A), Interim Final*, December 1989 (USEPA, 1989). COPC selection was completed for each environmental medium (surface and subsurface soil) using analytical data obtained during this investigation. Chemicals detected in environmental media during the field investigation were evaluated in this section to select COPCs for quantitative evaluation in the baseline HHRA. Chemicals selected as COPCs that could not be quantitatively evaluated are discussed in the uncertainties section (Section 2.5) of the baseline HHRA.

2.1.1 COPC Selection Criteria

The primary criterion used in selecting chemicals as COPCs at Site 12 is a comparison of maximum detected sample concentrations to the USEPA Region III Risk-Based Concentration (RBC) Values (USEPA, 2002c), in accordance with USEPA Region III Selection of Contaminants of Concern by Risk-Based Screening (SCCRBS) guidance (USEPA, 1993).

In conjunction with concentration comparisons to the USEPA Region III RBC values, a comparison to concentrations detected in field and laboratory blanks was conducted by a third-party validator, to ensure that only site-related contaminants are evaluated in the quantitative estimation of human health effects. Furthermore, those constituents generally considered to be essential nutrients (calcium, magnesium, potassium, and sodium, which have relatively low toxicity) were not evaluated in this baseline HHRA.

The toxicity of a chemical detected in a given environmental medium, as well as the history of site-related activities are other important criteria applied in selecting COPCs at Site 12. Therefore, in conjunction with concentration comparisons to USEPA Region III RBC values, evaluations of toxicity and site history were considered to determine whether chemicals

eliminated by a direct comparison to RBC values should be re-included as COPCs. Each of the aforementioned criteria is discussed in the paragraphs that follow.

USEPA Region III RBC Values – Region III RBC values were derived using conservative USEPA promulgated default values and the most recent toxicological criteria available. RBCs for potentially carcinogenic and noncarcinogenic chemicals were individually derived based on a target Incremental Lifetime Cancer Risk (ILCR) of 1×10^{-6} and a target Hazard Quotient (HQ) of 1.0, respectively. For potential carcinogens, the toxicity criteria applicable to the derivation of the RBC are oral and inhalation cancer slope factors; for noncarcinogens, they are chronic oral and inhalation reference doses. For noncarcinogens, each RBC value was reduced by a factor of 10 to ensure that chemicals with additive effects are not prematurely eliminated during screening (USEPA, 1993a).

In this baseline HHRA, constituents identified in soil will be compared to residential soil RBCs.

Blank Concentrations – If a chemical is detected in both the environmental sample and a blank sample, it may not be retained as a COPC, in accordance with RAGS, depending on the concentration of the chemical in the media. Therefore, blank data were compared with results from environmental samples. If the blanks contained detectable results for common laboratory contaminants (i.e., acetone, 2-butanone, methylene chloride, toluene, and phthalate esters), environmental sample results were considered as positive results only if they exceed 10 times the maximum amount detected in the associated blank. If the chemical detected in the blank(s) is not a common laboratory contaminant, environmental sample results were considered as positive results only if they exceeded five times the maximum amount detected in the associated blank(s) (USEPA, 1991a). Furthermore, the elimination of an environmental sample result would directly correlate to a reduction in the prevalence of the contaminant in that media.

Associated blanks collected during the field investigation for Site 12 included field (water source) blanks, trip blanks, and rinsate blanks. The aforementioned methodologies for evaluating blanks were implemented during independent third party analytical data validation prior to the selection of COPCs in the risk assessment.

Essential Nutrients - Despite their inherent toxicity, certain inorganic constituents are essential nutrients. Essential nutrients need not be considered further in the baseline HHRA if they are present in relatively low concentrations (i.e., slightly elevated above naturally occurring levels), or if the constituent is toxic at doses much higher than those which could be assimilated through exposures at the site (USEPA, 1989). Elements evaluated as essential nutrients include calcium, magnesium, potassium, and sodium. Although iron is considered an essential nutrient, it is evaluated quantitatively in this HHRA since toxicity criteria are available for this analyte.

2.1.2 Re-inclusion of Chemicals as COPCs

Chemicals can be re-included as COPCs for quantitative evaluation in the baseline HHRA, despite having been eliminated as such from a comparison to RBC values (or other aforementioned criteria). For example, a chemical that was detected at concentrations below the corresponding RBC value may be re-included as a COPC if a chemical is considered a Class A carcinogen (human carcinogen), or if it is reasonable to assume that the chemical could be site-related (especially if it has been detected in other media of concern). In addition, all carcinogenic PAHs (cPAHs) detected in a medium of concern are re-included as COPCs if only one cPAH is retained as a COPC in that medium based on the potential additive toxic effects of cPAHs.

2.1.3 Selection of COPCs

The samples collected at Site 12 were separated into different sample assemblages for the selection of COPCs to conservatively account for potential exposure conditions. Site 12 soil samples were separated into two assemblages to include the surface soil (0.0 to 0.5-feet bgs) and subsurface soil (depths from 0.5 to 2 feet bgs). The 0 to 0.5 foot interval was separated as surface soil rather than all of the samples from depths up to two feet bgs (the likely long term exposure assemblage) to conservatively account for the greater likelihood of exposure to these soils assuming that no future disturbance of the soil profile occurs to produce equal potential exposure to all depths from zero to two feet bgs. This baseline HHRA selects COPCs from the following detected analytical parameters: VOCs, SVOCs, pesticides, PCBs, inorganics (metals). Furthermore, calcium, magnesium, potassium, and sodium were detected in almost every sample, however, these constituents were considered to be essential nutrients and were therefore, not retained as COPCs in soil at Site 12.

Tables 2-1 and 2-2 present the selection of COPCs for surface and subsurface soil, respectively, based on comparison of the maximum detected concentration with the USEPA Region III RBC values and consideration of other applicable criteria (i.e., site history and chemical toxicity). The shaded areas in the Tables indicate constituents retained as COPCs. Information is presented in these Tables only for those constituents detected at least once in the medium of interest. Other statistical information is presented in Attachment A. The following paragraphs present the rationale for selection of COPCs.

2.1.3.1 Surface Soil

The COPC selection summary for the surface soil is presented on Table 2-1.

There was only a single detection of the VOC toluene detected in the surface soil from Site 12 at a concentration far below its corresponding residential soil RBC value. Therefore, VOCs were not retained as COPCs.

Benzo(a)pyrene was detected at a concentration in a single sample above its respective residential soil RBC value and was retained as a COPC for surface soil. Benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were detected at concentrations less than their respective residential soil RBC values but were retained as COPCs for surface soil because of the possible additive effects of cPAH exposure.

Inorganics were detected in all surface soil samples at Site 12. Only aluminum and iron were detected at concentrations greater than residential soil RBC values and were retained as COPCs for surface soil.

2.1.3.2 Subsurface Soil

The COPC selection summary for the total soil sample assemblage is presented on Table 2-2. Iron was the only analyte detected at a concentration in excess of its RBC for subsurface soil and was retained as a COPC.

2.1.4 Summary of COPCs

The following presents a comprehensive list of all selected COPCs identified at Site 12.

Surface soil: Benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, aluminum, and iron.

Subsurface soil: Iron.

2.2 Exposure Assessment

The exposure assessment addresses each potential current and future exposure pathway contaminated media at the site. To determine whether human exposure could occur at Site 12 in the absence of remedial action, an exposure assessment that identified potential exposure pathways and receptors was conducted. The following four elements were considered to ascertain whether a complete exposure pathway exists (USEPA, 1989):

- A source and potential mechanism of chemical release
- An environmental retention or transport medium
- A point of potential human contact with the contaminated medium
- An exposure route (e.g., ingestion) at the contact point

Relevant equations for assessing intakes and exposure factors were obtained from RAGS (USEPA, 1989), *Exposure Factors Handbook* (USEPA, 1997b), *Dermal Exposure Assessment: Principles and Applications, Interim Report* (USEPA, 1992a), and *Standard Default Exposure Factors, Interim Final* (USEPA, 1991b). Unless otherwise noted, the values assumed for exposure factors used in the dose evaluation equations for assessing exposure were obtained from recommended values from statistical distributions provided in the Exposure Factors Handbook and other EPA HHRA guidance documents.

2.2.1 Land Use and Potential Human Receptors

CAX will most likely continue to function as a storage depot. Today the mission of CAX includes supplying Atlantic Fleet ships and providing recreational opportunities to military and civilian personnel. Outdoor recreational facilities and activities available include: 13 cabins, 19 recreational vehicle sites, camp sites, an 18-hole golf course, swimming pool, ball fields, freshwater and saltwater fishing, boating, wildlife watching, and hunting (DON, 1998). There are no drinking water wells at CAX. As of October 2002, Newport News Waterworks, a department of the City of Newport News, provides drinking water to CAX.

Based on information available regarding the physical features, site setting, site historical activities, and current and expected land uses, the following potential human receptors have been selected for evaluation at Site 12.

- Current/Future On-Site Adolescent Trespassers (7-15 years)
- Current/Future On-Site Adult Trespassers
- Current On-Site Workers
- Future On-Site Adult Industrial/Commercial Workers
- Future Resident Younger Children (1-6 years)

- Future Resident Adults
- Future Adult Construction Workers

Current potential human receptors potentially exposed to COPCs detected in environmental media at Site 12 are limited to on-site adult and adolescent trespassers and CAX workers. Future receptors include industrial/commercial workers employed at the site. Although future residential development of Site 12 is highly unlikely, future residential exposure for potential adult and younger child receptors was considered in accordance with USEPA guidance and also to provide an upper bound for potential risks. In addition, future construction workers that may perform excavation and housing construction activities were evaluated as potential receptors.

2.2.2 Exposure Pathways

The potential human receptors and exposure pathways evaluated at Site 12 were selected considering current and future potential land use for CAX. The following paragraphs present the rationale for the selection of each pathway.

Potential exposure to COPCs and media of concern for the current on-site adult and adolescent trespassers and CAX workers includes accidental ingestion and dermal contact with the surface soil. Fugitive dust generation from surface soil is not considered to be a significant potential release mechanism at this site since it is covered to a great extent by vegetation. However, inhalation of fugitive dusts from surface soil is evaluated to maintain a conservative approach.

In a current scenario, on-site industrial/commercial workers include CAX personnel who would be responsible for groundskeeping or other maintenance activities. In the future scenario, the industrial/commercial worker would include any employee engaged in long term activities at the site. Potential exposure to COPCs and media of concern at Site 12 for the current industrial/commercial worker includes accidental ingestion and dermal contact with surface soil and inhalation of fugitive dusts emanating from surface soil.

Despite the unlikely nature of residential development by the military or general public, future residential exposure by children and adults will be evaluated. Future adult and child residential receptors could potentially be exposed to COPCs in surface soil and subsurface soil, by ingestion, dermal contact, and inhalation of fugitive dusts.

Potential exposure to COPCs at Site 12 could occur in the future if utilities or buildings in the area are constructed. The future construction worker will, therefore, be evaluated for accidental ingestion, dermal contact, and inhalation of fugitive dust in surface and subsurface soil during excavation activities.

In summary, the following potential human exposure receptors and exposure pathways are being retained for quantitative evaluation in this HHRA.

- Current On-Site Adult and Adolescent (7-15 years old) Trespassers:
  - Accidental ingestion of surface soil
  - Dermal contact with surface soil
  - Inhalation of fugitive dust in surface soil

- Current/Future On-Site Adult Industrial/Commercial Workers:
  - Accidental ingestion of surface soil
  - Dermal contact with surface soil
  - Inhalation of fugitive dust in surface soil

- Future On-Site Adult and Younger Child (1-6 years old) Residents:
  - Accidental ingestion of surface soil
  - Dermal contact with surface soil
  - Inhalation of fugitive dust in surface soil
  - Accidental ingestion of subsurface soil
  - Dermal contact with subsurface soil
  - Inhalation of fugitive dust in subsurface soil

- Future On-Site Adult Construction Workers:
  - Accidental ingestion of surface soil
  - Dermal contact with surface soil
  - Inhalation of fugitive dust in surface soil
  - Accidental ingestion of subsurface soil
  - Dermal contact with subsurface soil
  - Inhalation of fugitive dust in subsurface soil

2.2.3 Conceptual Site Model

Development of a conceptual site model of potential exposure is critical in evaluating all potential exposures for the aforementioned human receptors. The conceptual site model describes the potential exposure in terms of potential sources of contamination, affected media, and all potential routes of migration of the contaminants present. The conceptual site model for Site 12 is presented in Figure 2-1.

2.2.4 Quantification of Exposure

The chemical concentrations used in the estimation of Chronic Daily Intakes (CDIs) and Dermally Absorbed Doses (DADs) for each medium are considered to be representative of potential exposure encountered by each receptor throughout the time of exposure. The manner in which environmental data are represented depends partly on the number of samples and sampling locations available for a given area and a given medium. For example, exposure can occur to a portion of the site (i.e., a "hotspot") or the entire site depending on the type of scenario considered for a given receptor.

To quantify exposure, analytical data must be evaluated to determine its distributional nature. In general, two types of distributions are applied to environmental data; these are the normal and lognormal distributions. For example, most large data sets from soil sampling are lognormally distributed rather than normally distributed. The geometric mean is the best estimator of central tendency for a lognormal data set (USEPA, 1992b). However, most Agency health criteria are based on the long-term average exposure, which is expressed as the sum of all daily intakes divided by the total number of days in the averaging period. The geometric mean of a set of sampling results may not adequately represent random exposure and the cumulative intake that would result from long-term contact with site contaminants.

Potential exposure to soil at Site 12, regardless of location, is considered as having an equal probability of occurrence as an individual moves randomly across the site. Therefore, for these media, the exposure point concentration for a constituent in the intake equation can be reasonably estimated as the arithmetic average concentration of site sampling data. USEPA supplemental risk assessment guidance (USEPA, 1992b) states that the average concentration is an appropriate estimator of the exposure concentration for two reasons: 1) carcinogenic and chronic noncarcinogenic toxicity criteria are based on lifetime average exposures; and 2) the average concentration is most representative of the concentration that would be contacted over time. However, uncertainty is inherent in the estimation of the true average constituent concentration at the site.

A conservative estimate of the arithmetic average concentration recommended by USEPA (1992b) is the 95 percent upper confidence limit of the arithmetic mean concentration (95 percent UCL). In order to estimate the 95 percent UCL for soil, a normal distribution was assumed to represent the occurrence of all COPC-detected concentrations for sample data sets greater than or equal to five. The maximum concentration is used for the concentration term when the sample data set is five or less. Furthermore, if the 95 percent UCL of the arithmetic mean exceeds the maximum detected concentration in a given data set, the maximum detected concentration will be used to represent the concentration term for that COPC.

The 95 percent UCL was calculated using the following equation (USEPA, 1992b):

$$\text{Normal } 95\% \text{ UCL} = \bar{x} + t\,(s/\sqrt{n})$$

Where:

Normal 95% UCL = 95th percent upper confidence limit for the arithmetic mean concentration

$\bar{x}$ = mean
s = standard deviation
t = Student t statistic (Gilbert, 1987)
n = number of samples

The frequency of detection as well as the maximum detected values for the analytical results are presented in Attachment A of this report. Ninety-five percent UCL values and mean values are also presented in Attachment A. The equations for estimating intakes due to direct exposures to site-related chemicals for the various identified pathways are presented in Attachment D.

For results reported as "nondetect" (i.e., results flagged with the following validation qualifiers: U, UJ, UL, and UK), a value of one half of the sample-specific detection limit was used to calculate the 95 percent UCL. A value of half the detection limit was assigned to nondetects when estimating the 95 percent UCL and the arithmetic mean because the actual value could be between zero and a value just below the detection limit. Ninety-five percent UCLs were calculated only for the constituents detected in at least one sample collected from the environmental medium of interest. Estimated concentrations also were used to calculate the 95 percent UCL, such as "J"-qualified (estimated), "L"-qualified (estimated, biased low) and "K"-qualified (estimated, biased high) data. Reported concentrations qualified with an "R" (rejected) were not used in the statistical evaluation.

According to the Region III Modifications to the National Functional Guidelines (NFGs), reported organic and inorganic concentrations that were qualified with a "B" were evaluated against the available field and laboratory blanks. This qualifies the organic/inorganic as a nondetect due to laboratory contamination. For constituents considered by RAGS to be common laboratory contaminants, chemicals were deemed positive detects only if their concentration exceeded 10 times the maximum blank concentration. For constituents not considered common laboratory contaminants, chemicals were considered as positive detects only if their concentration exceeded 5 times the maximum blank concentration.

2.2.5 Exposure Factors

Tables 2-3 presents the exposure factors used in the estimation of potential CDIs/DADs for COPCs retained for each receptor identified below. These exposure factors are input parameters in the dose evaluation equations that were used for the reasonable maximum exposure (RME) scenario. The goal of RME is to combine upper bound and mid-range exposure factors so that the result represents an exposure scenario that is both protective and reasonable, not the worst possible case (USEPA, 1991b). USEPA recommended exposure factors are used in conjunction with USEPA standard default exposure factors for the RME exposure scenario. When USEPA exposure factors are not available, best professional judgment and site-specific information are used to derive a conservative and defensible value. The following paragraphs present the rationale for the selection of exposure factors for each receptor group evaluated in the baseline HHRA.

2.2.5.1 Current On-Site Adult and Adolescent (7-15 years old) Trespassers

This scenario assumes that current adult and adolescent (7 - 15 years) trespassers could come into contact with surface soil at Site 12. Therefore, these receptors were evaluated for potential exposure to these media via incidental ingestion and dermal contact, and surface soil via inhalation of fugitive dust. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 2-3.

A 70 kg adult and a 45 kg adolescent (USEPA, 1997b) were assumed to have exposure durations of 24 years and 9 years, respectively (USEPA, 1991b). The exposure time in relationship to the inhalation of fugitive dusts was estimated to be 12 hours per day (USEPA, 1997b). The ingestion rate of surface soil was assumed to be 100 mg/day for both the adolescent and the adult (USEPA, 1989), with a 100 percent fraction ingested from the source (professional judgment). The exposure frequency was assumed to be 52 events/year, based on anticipated exposures of one day/week/year (professional judgment). A respiration rate of 0.83 m^3/hr for the adult and adolescent (USEPA, 1991b) was also used in relationship to inhalation of fugitive dusts from surface soil. Averaging times of 8,760 days for adults and 3,285 days for adolescents for noncarcinogens, and 25,550 days for carcinogens were also used (USEPA, 1989).

The USEPA recommended weighted dermal adherence factor (AF) of 0.07 mg/cm^2 for the residential adult was used for the adult trespasser (USEPA, 1997a). This is based on the 50th percentile weighted SAF for gardeners, which is the activity determined to represent a reasonable, high-end contact activity. The USEPA recommended weighted 0.2 mg/cm^2 AF for the young child was conservatively used for the adolescent trespasser and is based on the 95th percentile weighted AF for children playing at a day care center or in wet soil (USEPA, 1997a). Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2001) or USEPA Region III default dermal absorption values of 1 percent for inorganics were applied in evaluating dermal

exposures to soil (USEPA, 1995a). Skin surface areas of 5,300 cm^2 for the adolescent (representing 50th percentile body-part SA [average of male/female] for the head, forearms, hands, lower legs and feet of a <7 to <18 year old) and 5,700 cm^2 for the adult (USEPA 1997a) were assumed for the surface soil.

2.2.5.2 Current/Future On-Site Adult Industrial/Commercial Workers

This scenario assumes that current adult industrial/commercial workers could come into contact with surface soil. Therefore, this receptor was evaluated for potential exposure to surface soil via incidental ingestion, dermal contact, and inhalation of fugitive dust. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 2-3.

The IR for industrial/commercial workers exposed to surface soil was assumed to be 50 mg/day (USEPA, 1991b), and the fraction ingested was assumed to be 100 percent. An exposure frequency (EF) of 250 days per year (USEPA, 1991b) was used in conjunction with exposure duration of 25 years (USEPA, 1991b). A respiration rate of 0.83 m^3/hr for the adult (USEPA, 1989) was also used in relationship to inhalation of fugitive dusts from surface soil. An averaging time (AT) of 70 years or 25,550 days was used for exposure to potentially carcinogenic compounds while an averaging time of 9,125 days was used for noncarcinogenic exposures.

There is a potential for the industrial/commercial workers to absorb COPCs by dermal contact. A skin surface area of 3,300 cm^2 for an adult (USEPA, 1997b) assumed to wear a short-sleeved shirt, long pants, and shoes, was used to evaluate dermal contact with soil. The soil to skin adherence factor (AF) of 0.2 mg/cm^2 was used and is based on the 50th percentile weighted AF for utility workers, which is the activity determined by USEPA to represent a reasonable, high-end contact activity (USEPA, 1997b). Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2001) or USEPA Region III default dermal absorption values of 10 percent for PAHs and 1 percent for inorganics were applied in evaluating dermal exposures to soil (USEPA, 1995a).

The exposure parameters for the future industrial/commercial worker are the same as those for the current worker with the exception of increased ingestion rate of soil (100 mg/day; USEPA, 1993) and respiration rate of 1.1 m^3/hour (USEPA, 1997b; low level of activity) and a decreased AF of 0.07 mg/cm^2 (USEPA, 1997b) to account for different potential work activities.

2.2.5.3 Future On-Site Adult and Younger Child (1-6 years old) Residents

This scenario assumes that future adult and young child (1-6 years) residents could come into contact with surface and subsurface soil at Site 12 via accidental ingestion, dermal contact, and inhalation of fugitive dust. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 2-3.

Future adult and young child residents could contact soil during outdoor recreational activities in the area immediately surrounding their homes. A 70 kg adult and a 15 kg child were assumed for exposure durations of 24 years and 6 years, respectively (USEPA, 1989). The exposure time was conservatively assumed to be 24 hours per day. The ingestion rate for soil was assumed to be 200 mg/day for the young child and 100 mg/day for the adult (USEPA, 1991b), with a 100 percent fraction ingested from source, over 350 days/year (USEPA, 1991b). Respiration rates of 0.83 m^3/hr for the child (professional judgment) and 0.83 m^3/hr for the adult (USEPA, 1991b) were

used for inhalation of fugitive dusts. Averaging times of 8,760 days for adults and 2,190 days for children for noncarcinogens, and 25,550 days for carcinogens were also assumed (USEPA, 1989).

The USEPA recommended weighted AF of 0.07 mg/cm^2 was used for the residential adult (USEPA, 1997b). This is based on the 50th percentile weighted AF for gardeners, which is the activity determined to represent a reasonable, high-end contact activity. The USEPA recommended weighted 0.2 mg/cm^2 AF for the young child was used and is based on the 95th percentile weighted SAF for children playing at a day care center or in wet soil (USEPA, 1997b). Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2001) or USEPA Region III default dermal absorption values of 10 percent for PAHs and 1 percent for inorganics were applied in evaluating dermal exposures to soil (USEPA, 1995a). Skin surface areas of 2,800 cm^2 for the young child and 5,700 cm^2 for the adult (USEPA 1997b) were assumed. These are the SA values currently recommended by the USEPA for exposure to contaminated soil and are the averages of the 50th percentiles for males and females greater than 18 years of age (adults) and from <1 to <6 years old (young children).

2.2.5.4 Future On-Site Adult Construction Workers

Potential exposures to soil COPCs may occur to construction workers while performing soil excavation and construction activities at Site 12. Exposure pathways evaluated include accidental ingestion, dermal contact, and inhalation of fugitive dust of surface and subsurface soil. A summary of the exposure parameters is discussed in the following paragraphs and presented on Table 2-3. Exposure was assumed to occur for 8 hours per day (professional judgment), 250 days per year (USEPA, 1991), for a construction period of 1 year (professional judgment). A USEPA default value for the soil ingestion rate of 480 mg/day, a 100 percent fraction ingested from source, and a respiration rate of 2.5 m^3/hour (USEPA, 1997b; heavy level of activity) was also assumed for a 70 kg construction worker (USEPA, 1989). A skin surface area of 3,300 cm^2 for an adult (USEPA 1997b) assumed to wear a short-sleeved shirt, long pants, and shoes, was used to evaluate dermal contact with soil and groundwater. The soil to skin adherence factor of 0.2 mg/cm^2 (USEPA, 1997b) was used. Dermal absorption values provided in USEPA RAGS Part E (USEPA, 2001) or USEPA Region III default dermal absorption values of 10 percent for PAHs and 1 percent for inorganics were applied in evaluating dermal exposures to soil (USEPA, 1995a). The averaging time of 365 for noncarcinogens and 25,550 days for carcinogens, respectively, were also used (USEPA, 1989).

2.3 Toxicity Assessment

Section 2.2 presented potential exposure pathways and receptors for this baseline HHRA. This section will review the available toxicological information for COPCs retained for quantitative evaluation.

An important component of the HHRA process is the relationship between the dose of a compound (amount to which an individual or population is potentially exposed) and the potential for adverse health effects resulting from exposure to that dose. Dose-response relationships provide a means by which potential public health impacts may be evaluated. Standard Reference Doses (RfDs) and/or Carcinogenic Slope Factors (CSFs) have been developed for many of the COPCs. This section provides a brief description of these parameters.

Quantitative indices of toxicity and USEPA weight-of-evidence classifications are presented in Table 2-4 for the identified COPCs. The hierarchy (USEPA, 1989) for choosing these values was:

- Integrated Risk Information System (IRIS) (USEPA, 2002b)
- Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997a)
- National Center for Environmental Assessment (NCEA)

The IRIS database is updated monthly and contain verified RfDs, Reference Concentrations for inhalation (RfCs), and CSFs. The USEPA has formed an RfD work group to review existing data used to derive RfDs and RfCs. Once this task has been completed the verified RfD appears in IRIS. Like the RfD Work Group, the USEPA has also formed the Carcinogen Risk Assessment Verification Endeavor (CRAVE) Work group to review and validate toxicity values used in developing CSFs. Once the slope factors have been verified via extensive peer review, they also appear in the IRIS database.

HEAST, on the other hand, provides interim (unverified) and verified RfDs, RfCs and CSFs. This document is published quarterly and incorporates any applicable changes to its database.

2.3.1 Reference Doses

The RfDs and RfCs are developed for chronic and/or subchronic human exposure to chemicals and are based solely on the noncarcinogenic effects of chemical substances. These values are defined as an estimate of a daily exposure level for the human population, including sensitive subpopulations, that is likely to be without an appreciable risk of adverse effects during a lifetime. The RfD is expressed as dose (mg) per unit body weight (kg) per unit time (day). The RfC is expressed as dose (mg) per cubic meter of air (m^3).

2.3.2 Carcinogenic Slope Factors

CSFs are used to estimate an upper bound lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen (USEPA, 1989). This factor is reported in units of (milligram per kilogram [mg/kg/day])$^{-1}$ and is derived through an assumed low-dosage linear multistage model and an extrapolation from high to low dose-responses determined from animal studies. The value used in reporting the slope factor is the 95 percent UCL. CSFs can also be derived from USEPA promulgated unit risk values for air and/or water. CSFs derived from unit risks cannot, however, be applied to environmental media other than the medium considered in the unit risk estimate.

Slope factors are also accompanied by weight-of-evidence classifications, which designate the strength of the evidence that the COPC is a potential human carcinogen.

2.3.3 Dermal Absorption Efficiency

Many of the RfDs and CSFs are derived from oral toxicological studies based on administered dose, and do not account for the amount of a substance that can penetrate exchange boundaries after contact (e.g., absorbed dose). As a result, there is very little information available regarding dermal toxicity criteria. Therefore, in order to account for a difference in toxicity between an administered dose and an absorbed dose, the RfDs and CSFs (that were based on an administered

dose) were adjusted, as described by the USEPA (USEPA, 1989; 2001), using experimentally derived oral absorption efficiencies. The oral RfD is adjusted by multiplying the RfD by an oral absorption efficiency value to represent a dermally absorbed dose. The oral CSF is adjusted by dividing the CSF by an oral absorption efficiency value to represent a dermally absorbed dose. The oral absorption efficiencies were obtained from sources such as the NCEA, IRIS, the Agency for Toxic Substance and Disease Registry (ATSDR) toxicological profiles, toxicology publications, toxicology references, and USEPA Regional Offices. RAGS, Part E, Supplemental Guidance for Dermal Risk Assessment (USEPA, 2001) was used as the primary resource for oral absorption efficiencies. In some instances, published information was not available to determine the absorption efficiency. On these occasions, adjustments to the toxicity value were not conducted (e.g., an absorption efficiency of 100 percent was assumed).

2.4 Risk Characterization

The risk characterization combines the selected COPCs, the exposure assessment, and the toxicity assessment to produce a quantitative estimate of current potential human health risks associated with Site 12. Estimated ILCRs and Hazard Indexes (HIs) for the identified potential receptors and pathways from Section 2.2.2 are calculated and discussed in this section. The ILCRs and HIs were calculated for each of the soil COPCs using the 95 percent UCL of the arithmetic mean as the exposure point concentration, or the maximum concentration if the 95 percent UCL exceeded the maximum.

2.4.1 Carcinogenic Compounds

Quantitative risk calculations for potentially carcinogenic compounds estimate inferentially the potential ILCR for an individual in a specified population. This unit of risk refers to a potential cancer risk that is above the background cancer risk in unexposed individuals. For example, an ILCR of 1×10^{-6} indicates that an exposed individual has an increased probability of one in one million of developing cancer subsequent to exposure, over the course of their lifetime.

The potential lifetime ILCR for an individual was estimated from the following relationship:

$$\text{ILCR} = \sum_{i=1}^{n} (\text{CDI}_i \text{ or } \text{DAD}_i) \times \text{CSF}$$

where the CSF_i is expressed as $(mg/kg/day)^{-1}$ for compound I, and the CDI_i and DAD_i are expressed as mg/kg/day for compound I. Since the units of CSF are $(\text{mg chemical/kg body weight-day})^{-1}$ and the units of intake or dose are mg chemical/kg body weight-day, the ILCR value is dimensionless. The aforementioned equation was derived assuming that cancer is a nonthreshold process and that the potential excess risk level is proportional to the cumulative intake over a lifetime.

For quantitative estimation of risk, it is assumed that cancer risks from various exposure routes are additive. Estimated ILCR values will be compared to 1×10^{-6} to 1×10^{-4}, which represents the target risk range of ILCR values, considered by the USEPA to represent an acceptable (i.e., *de minimis*) risk (USEPA, 1990).

2.4.2 Noncarcinogenic Compounds

Noncarcinogenic compounds assume that a threshold toxicological effect exists. Therefore, the potential for noncarcinogenic effects is calculated by comparing (i.e., dividing) CDI_i and DAD_i levels with RfDs for each COPC.

Noncarcinogenic effects are estimated by calculating the HQ for individual chemicals and the HI for overall chemicals and pathways by the following equation:

$$HI = \sum_{i=1}^{n} HQ_i$$

where: $HQ_i = (CDI_i \text{ or } DAD_i)/RfD_i \text{ or } RfC_i$

An HQ is the ratio of the daily intake or absorbed dose to the reference dose (or reference concentration for inhalation exposure). CDI_i is the chronic daily intake (mg/kg/day) of contaminant I; DAD_i is the dermally absorbed dose (mg/kg/day) of contaminant I, and RfD_i is the reference dose (mg/kg/day) of the contaminant I over a prolonged period of exposure. RfC_i is the reference concentration used when determining exposure due to inhalation. Since the units of RfD are mg/kg-day and the units of CDI/DAD are mg/kg-day, the HQ and HI are dimensionless. To account for the additivity of noncarcinogenic risk following exposure to numerous chemicals, the HI, which is the sum of all the HQs, will be calculated. A ratio of 1.0, considered by the USEPA to represent an acceptable hazard level (USEPA, 1990), is used for examination of the HQ and HI. Ratios less than 1.0 indicate that adverse noncarcinogenic health effects are unlikely. Ratios greater than 1.0 indicate the potential for adverse noncarcinogenic health effects to occur at that exposure level and caution should be exercised. However, this does not mean that adverse effects will definitely be observed since the RfD incorporates safety and modifying factors to ensure that it is well below that dose for which adverse effects have been observed. This procedure assumes that the risks from exposure to multiple chemicals are additive, an assumption that is probably valid for compounds that have the same target organ or cause the same toxic effect. It should be noted that this summation approach ignores potential interactions among the various chemicals at the site, which may either enhance or reduce the potential health effects.

2.4.3 Potential Human Health Effects

Total carcinogenic risks and noncarcinogenic hazard levels were calculated assuming exposure to environmental conditions at Site 12 and are summarized in Table 2-5. Tables 2-6 through 2-10 present receptor-specific summaries of the total site risks and hazard levels by pathway. Risk calculations presenting the ILCR and HI values, by pathway and COPC at Site 12 are presented in Attachment D.

2.4.3.1 Current On-Site Adult and Adolescent Trespassers

There were no carcinogenic risks calculated that exceeded USEPA's acceptable risk range of 1×10^{-6} to 1×10^{-4} for the current on-site adult and adolescent trespassers upon exposure to

surface soil via accidental ingestion, dermal contact, and inhalation of fugitive dusts. There were no adverse health effects calculated that exceeded USEPA's acceptable value of 1.0 for the adult and adolescent trespassers. These results are presented in Table 2-6.

2.4.3.2 Current On-Site Workers

There were no carcinogenic risks or adverse health hazards calculated that exceeded USEPA's acceptable criteria for the current on-site industrial/commercial worker upon exposure to surface soil via accidental ingestion, dermal contact, and inhalation of fugitive dusts. These results are presented in Table 2-7.

2.4.3.3 Future Adult and Younger Child Residents

Table 2-8 presents the carcinogenic and noncarcinogenic risks calculated for potential future on-site adult and child residents who may be exposed to COPCs in Site 12 surface soil and subsurface soil via ingestion, dermal contact, and inhalation of fugitive dust. The total lifetime ILCR of 3.7×10^{-6} does not exceed the USEPA acceptable risk range of 1×10^{-6} to 1×10^{-4}. The calculated total HIs for residential receptors do not exceed USEPA's acceptable criterion.

2.4.3.4 Future Industrial/Commercial Workers

There were no carcinogenic risks or adverse health hazards calculated that exceeded USEPA's acceptable criteria for the future industrial/commercial worker upon exposure to surface soil via accidental ingestion, dermal contact, and inhalation of fugitive dusts. These results are presented in Table 2-9.

2.4.3.5 Future Construction Workers

Table 2-10 presents the carcinogenic risks and noncarcinogenic hazard levels calculated for potential future construction workers who may be exposed to COPCs in surface and subsurface soil from Site 12 via ingestion, dermal contact, and inhalation of fugitive dusts. The risks and hazard levels do not exceed USEPA acceptable criteria.

2.5 Sources of Uncertainty

Uncertainties are encountered throughout the process of performing a risk assessment. This section discusses the sources of uncertainty inherent in the following elements of the human health evaluation performed for Site 12:

- Sampling and analysis
- Selection of COPCs
- Exposure assessment
- Toxicity assessment
- Iron
- Risk characterization

In addition, the USEPA stresses the importance of recognizing the unique characteristics and circumstances of each facility and the need to formulate site-specific responses. However, many

of the assumptions presented in this document were derived from USEPA guidance, which is designed to provide a conservative approach and cover a broad variety of cases. As such, the generic application of such assumptions to a site in the RME case scenario may work against the objectives of formulating a site-specific response to a constituent presence (i.e., it is possible that the site risks may be over estimated). Uncertainties associated with this risk assessment are discussed in the following paragraphs. Table 2-11 summarizes the potential effects of certain uncertainties on the estimation of human health risks.

2.5.1 Sampling and Analysis

The development of a risk assessment depends on the reliability of, and uncertainties associated with, the analytical data available to the risk assessor. These, in turn, are dependent on the operating procedures and techniques applied to the collection of environmental samples in the field and their subsequent analyses in the laboratory. To minimize the uncertainties associated with sampling and analysis at Site 12, USEPA approved sampling and analytical methods were employed. Data were generated following USEPA's Statement of Work for Contract Laboratory Program (CLP). Samples were analyzed for TCL organics, TAL inorganics. Samples were taken from locations specified in the approved Work Plan along with the necessary Quality Assurance/Quality Control (QA/QC) samples.

Analytical data are limited by the precision and accuracy of the methods of analysis that are reflected by the Relative Percent Difference (RPD) of duplicate analyses and the percent recovery of spikes, respectively. In addition, the statistical methods used to compile and analyze the data (mean concentrations, detection frequencies) are subject to the overall uncertainty in data measurement. Furthermore, chemical concentrations in environmental media fluctuate over time and with respect to sampling location. Analytical data must be sufficient to consider the temporal and spatial characteristics of contamination at the site with respect to exposure.

Data collected from these sites were validated by an independent third-party validator. Data validation serves to reduce some of the inherent uncertainty associated with the analytical data by establishing the usability of the data to the risk assessor who may or may not choose to include the data point in the estimation of risk. Data qualified as "J" (estimated) were retained for the estimation of risk at these sites. Data can be qualified as estimated for many reasons including a slight exceedence of holding times, high or low surrogate recovery, or intra sample variability. Data qualified "R" (unreliable) were not used in the estimation of risk due to the unusable nature of the data. Due to the comprehensive sampling and analytical program at these sites, the loss of some data points did not significantly increase the uncertainty in the estimation of risk.

2.5.2 Selection of COPCs

The selection of COPCs is performed in a risk assessment following the evaluation of data. Analytical data also must be comprehensive in order to address the COPCs associated with the site. COPCs encountered at Site 12 include some SVOCs and inorganics. Inorganic constituents were detected in every medium investigated; they were the most dominant class of chemicals detected at Site 12. Soil COPCs were selected based on comparisons of the maximum detected concentration with Region III residential soil RBC values.

Region III RBC values are based on exposure assumptions and equations that are intended to introduce conservatism in the risk assessment process by changing the COPC screening method from a relative toxicity screen as presented in RAGS, to an absolute comparison of risk.

However, the use of the Region III RBC values, which incorporate a set of non-site-specific assumptions in the selection of COPCs at Site 12, adds conservatism to the baseline HHRA. Furthermore, the use of residential soil RBC values in the selection of human health COPCs provides a very conservative screening tool.

It should be noted that PAHs, both carcinogenic and noncarcinogenic, were detected in the surface and subsurface soils at Site 12. It is known that PAHs do not occur alone, but rather, as mixtures. In some instances, PAHs can be re-included as COPCs even though they did not exceed screening criteria. Of the carcinogenic PAHs, benzo(a)pyrene is considered the most potent and has the most conservative toxicity criteria (e.g., CSF and RBCs). Furthermore, the toxicity criteria for the other cPAHs is based on research that suggests relative carcinogenic potency to benzo(a)pyrene. Consequently, benzo(a)pyrene was retained as a COPC (if it exceeded screening criteria) to represent a conservative approach. In addition, any other potentially carcinogenic PAH was retained.

Currently, base closure is not planned for CAX and future residential development is not considered an expected land use for the area. The application of the residential RBC values to soil COPC selections would, therefore, tend to result in a list of COPCs that could be considered conservative for a military facility. The use of conservative COPC selections in the baseline HHRA ensures the protection of public health in that the results of the baseline HHRA are incorporated into the determination of remedial alternatives and remedial action objectives, if necessary.

2.5.3 Exposure Assessment

In performing exposure assessments, uncertainties arise from several sources. Uncertainties arise in estimating the fate of a compound in the environment, including estimating release and transport in a particular environmental medium. Uncertainty associated with the potential for exposure to a particular medium to occurs at all is significant. The details of quantification of chemical intakes resulting from contact by a receptor with a particular medium also introduce uncertainty.

To estimate an intake, certain assumptions must be made about exposure events, exposure durations, and the corresponding assimilation of constituents by the receptor. Exposure factors have been generated by the scientific community and have undergone review by the USEPA. The USEPA has published an Exposure Factors Handbook (USEPA, 1997b), which contains the best and latest values. Regardless of the validity of these exposure factors, they have been derived from a range of values generated by studies of limited numbers of individuals. In all instances, values used in this risk assessment, scientific judgments, and conservative assumptions agree with those of the USEPA.

The use of a RME approach, designed as not to underestimate daily intakes, was employed throughout this risk assessment. The use of 95 percent UCL estimates of the arithmetic mean versus maximum values as the concentration term in estimating the CDI or DAD for soil reduces the potential for underestimating exposure at Site 12.

2.5.4 Toxicological Assessment

In making quantitative estimates of the toxicity of varying dosages of compounds to human receptors, uncertainties arise from two sources. First, data on human exposure and the

subsequent effects are usually insufficient, if they are at all available. Human exposure data usually lack adequate concentration estimations and suffer from inherent temporal variability. Therefore, animal studies are often used and new uncertainties arise from the process of extrapolating animal results to humans. Second, to obtain observable effects with a manageable number of experimental subjects, high doses of a compound are often used. In this situation, a high dose means that high exposures are used in the experiment with respect to most environmental exposures. Therefore, when applying the results of the animal experiment to the human condition, the effects at the high doses must be extrapolated to approximate effects at lower doses. In extrapolating effects from high doses in animals to low doses in humans, scientific judgment and conservative assumptions are employed. In selecting animal studies for use in dose-response calculations, the following factors are considered:

- Studies are preferred where the animal closely mimics human pharmacokinetics.
- Studies are preferred where dose intake most closely mimics the intake route and duration for humans.
- Studies are preferred which demonstrate the most sensitive response to the compound in question.

For compounds believed to cause threshold effects (i.e., noncarcinogens) safety factors are employed in the extrapolation of effects from animals to humans and from high doses to low doses. In deriving carcinogenic potency factors, the 95 percent UCL value is used by the USEPA to prevent underestimation of potential risk.

Further conservatism in the baseline HHRA is also introduced through the use of experimentally-derived oral absorption efficiencies to account for a difference in the degree of toxicity between an administered dose and an absorbed dose. Equating the absorption efficiency of the dermal bi-phasic barrier to the absorption efficiency of the gastrointestinal lining is a very conservative approach that tends to overestimate the potential risk to human health.

In summary, the use of conservative assumptions, results in quantitative indices of toxicity that are not expected to underestimate potential toxic effects, but may overestimate these effects by an order of magnitude or more.

2.5.5 Iron

The element iron has been given a RBC value and toxicity values with which to evaluate potential human health risks. The studies that prompted the addition of a RBC value for iron are provisional only and have not undergone formal review by the USEPA. A provisional RfD has been derived for iron by the Superfund Technical Support Center (STSC) division of the Environmental Criteria and Affects Office. The provisional RfD is based on a NOAEL. Developing an RfD for iron is problematic because the dose-response curve for iron is "U-shaped". That is, health effects such as anemia occur at low doses due to deficiency (occurring in the U.S. in approximately 3.3 million women of childbearing age and 240,000 children aged 1-2 years), and high doses can produce toxic effects such as hemosiderosis and liver cirrhosis, while doses in between are beneficial for most of the population. The NOAEL is based on a study that compared the average intake of iron in the American population with biochemical indices of iron in blood (Looker et al., 1988) to demonstrate that the average intake was sufficient to prevent iron deficiency and insufficient to cause toxic effects of iron overload. The NOAEL (0.15 to 0.27

mg/kg-day) is divided by an uncertainty factor of 1, since iron is an essential element, to produce a provisional RfD of 0.3 mg/kg-day (STSC, 1999).

Although the STSC (1999) report places a high confidence in the critical study upon which the RfD is based; they place a medium confidence in the RfD. The RfD is reported to supply adequate levels of iron to meet the lifetime nutritional requirements for adults and adolescents but may not be protective of people with inherited disorders of iron metabolism (e.g., hemochromatosis which occurs in up to one million individuals in the U.S.; MMWR, 1998) and could be conservative if applied to exposure scenarios involving forms of iron with low bioavailability. This last point is borne out by studies of Ethiopian populations that have the highest per capita iron intake in the world (471 mg/day average daily intake) but for which adverse health effects have not been observed. This is attributed to the low bioavailability of the iron in Ethiopian food (STSC, 1999).

As applied to an incidental soil ingestion exposure scenario, it is important to note that the contribution of intake of iron from soil is expected to be minimal compared to dietary intake. For example, assuming soil with iron concentration of 15,000 mg/kg (a conservative estimate of background concentrations of iron in soil) and ingestion of 50 mg/day for adults, produces only 0.01 mg/kg-day iron from soil compared to a normal dietary level of 0.3 mg/kg-day. Furthermore, the bioavailability of iron from minerals in soil is expected to be significantly lower than the bioavailability of iron from food. (However, actual levels of bioavailability of iron from soil are not known.) For these reasons, and the fact that the primary sensitive population is those individuals with the medical condition of hemochromatosis which is caused by abnormal absorption of iron and which appears to occur irrespective of excess iron intake, the iron RfD is considered very conservative for use in risk assessment from environmental exposures and should be interpreted with considerable uncertainty.

For the scenarios where the HI values exceeded 1, iron had relatively large HQ values. If the provisional iron RBC value were reduced, a large proportion of the hazard index would be eliminated. However, by evaluating iron in the risk assessment, a conservative approach is taken so that potential toxic effects may be estimated.

In summary, the use of conservative assumptions results in quantitative indices of toxicity that are not expected to underestimate potential toxic effects, but may overestimate these effects by an order of magnitude or more.

2.5.6 Human Risk Characterization

The risk characterization bridges the gap between potential exposure and the possibility of systemic or carcinogenic human health effects, ultimately providing impetus for the remediation of the site or providing a basis for no remedial action.

Uncertainties associated with risk characterization include the assumption of chemical additivity and the inability to predict synergistic or antagonistic interactions between COPCs. These uncertainties are inherent in any inferential risk assessment. USEPA recommended inputs to the quantitative risk assessment and toxicological indices are calculated to be protective of the human receptor and to err conservatively in an effort not to underestimate the potential human health risks.

2.6 Summary and Conclusions

There were no carcinogenic risks or adverse health hazards calculated that exceeded USEPA's acceptable criteria for any current or future receptors potentially exposed to environmental conditions at Site 12. It is unlikely that adverse health effects would occur for these receptors upon exposure to Site 12 media.

3.0 REFERENCES

Baker Environmental (Baker). 2004. Final Round I Remedial Investigation Report. Site 1 – Landfill Near Incinerator. Naval Weapons Station Yorktown, Cheatham Annex Site. Williamsburg, Virginia. February 2004.

Baker. 2003. *Final Background Study. Naval Weapons Station Yorktown and Cheatham Annex Site.* Naval Weapons Station Yorktown, Yorktown, Virginia. September 2003.

Baker. 2002. *Draft Project Plans, Limited Field Investigation, Site 12.* Naval Weapons Station Yorktown, Cheatham Annex Site. Williamsburg, Virginia. May 2002.

Baker. 1995. *Final Summary of Background Constituent Concentrations and Characterization of the Biotic Community from the York River Drainage Basin.* Naval Weapons Station Yorktown, Yorktown, Virginia. July 1995.

Department of the Navy (DON). 1998. *Environmental Assessment for Recreational Cabins at Fleet and Industrial Supply Center Cheatham Annex.* December 1998.

Efroymson, R.A., Will, M.E., and Suter II, G.W. (1997a). *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process.* 1997 revision. Oak Ridge National Laboratory, Oak Ridge, TN. (ES/ER/TM-126/R2).

Efroymson, R.A., Will, M.E., Suter II, G.W., and Wooten, A.C. (1997b). *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants.* 1997 Revision. Oak Ridge National Laboratory. Oak Ridge, TN. (ES/ER/TM-85/R3).

Gilbert, 1987. *Statistical Methods for Environmental Pollution Monitoring.* Gilbert, Richard O. Van Nostrand Reinhold, New York, New York.

Looker, A., C.T. Sempos, C. Johnson and E.A. Yetley, 1988. *Vitamin-mineral Supplement Use: Association with Dietary Intake and Iron Status of Adults.* Journal of the American Dietetic Association, Vol. 88, pp. 808-814.

Morbidity and Mortality Weekly Report (MMWR), 1998. *Recommendations to Prevent and Control Iron Deficiency in the United States.* Vol. 47 (RR-3), pp. 1-36.

Naval Energy and Environmental Support Activity (NEESA). 1984. *Initial Assessment Study of Fleet and Industrial Supply Center (Norfolk) Cheatham Annex and Yorktown Fuels Division.* 1984.

Naval Facilities Engineering Command (NFESC). 2002. *Guidance for Environmental Background Analysis. Volume I: Soil.* NFESC User's Guide UG-209-ENV. April 2002.

Sims R.C. and Overcash M.R. 1983. Fate of Polynuclear Aromatic Compounds (PNAs) in Soil-Plant Systems. *Residue Reviews.* Volume 88.

Superfund Technical Support Center (STSC), 1999. *Risk Assessment Issue Paper for: Derivation of a Provisional RfD for Iron (CASRN 7439-89-6).* Reviewed in 1999 and reinstated without change from 1993 paper, January 5, 1999.

United States Environmental Protection Agency (USEPA). 2002a. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites.* Office of Emergency and Remedial Response. EPA 540-R-01-003.

USEPA, 2002b. *Integrated Risk Information System.* Environmental Criteria and Assessment Office, Cincinnati, Ohio.

USEPA. 2002c. *Risk-Based Concentration Summary Tables.* October 2002. Region III, Philadelphia, Pennsylvania.

USEPA, 2001. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim.* Office of Emergency and Remedial Response. Washington, D.C. September 2001. EPA/540/R/99/005.

USEPA. 2000. *Bioaccumulation Testing and Interpretation for the Purpose of Sediment Quality Assessment. Status and Needs.* Office of Water and Office of Solid Waste, Washington, D.C. EPA-823-R-00-001.

USEPA. 1998a. *Aerial Photographic Analysis. USN Supply Center - Cheatham Annex.* Williamsburg, Virginia. TS-PIC-980336 4S. May 1998.

USEPA, 1998b. *Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manuel (Part D, Standardizing Planning, Reporting, and Review of Superfund Risk Assessments), Interim.* Office of Emergency and Remedial Response. Publication 9285.7-01D. January 1998.

USEPA, 1997a. *Health Effects Summary Tables.* FY 1997. Office of Solid Waste and Emergency Response, Washington, D.C. May 1995. OERR 9200.6-303(95-1).

USEPA, 1997b. *Exposure Factors Handbook.* Office of Research and Development. Washington, D.C. August 1997. EPA/600/P-95/002F.

USEPA, 1995a. *Assessing Dermal Exposure from Soil.* Hazardous Waste Management Division, Office of Superfund Programs. Region III, Philadelphia, Pennsylvania. December 1995.

USEPA. 1995b. *Region III - Biological Technical Assistance Group Screening Levels (Revised).* Region III, Philadelphia, Pennsylvania. August 1995.

USEPA, 1993. *Selecting Exposure Routes and Contaminant of Concern by Risk-Based Screening, Region III Technical Guidance Manual.* Region III, Philadelphia, Pennsylvania. January 1993. EPA/903/R-93-001.

USEPA, 1992a. *Dermal Exposure Assessment: Principles and Applications.* Interim. Office of Research and Development. Washington, D.C. January 1992. EPA/600/8-91/011B.

USEPA, 1992b. *Risk Assessment Guidance for Superfund Volume I, Human Health Evaluation Manual Supplemental Guidance. Dermal Risk Assessment.* Interim Guidance. Office of Emergency and Remedial Response. Washington, D.C. August 18, 1992.

USEPA, 1991a. *Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses.* United States Environmental Protection Agency. 1991.

USEPA, 1991b. *Risk Assessment Guidance for Superfund Volume I. Human Health Evaluation Manual Supplemental Guidance: "Standard Default Exposure Factors" Interim Final.* Office Solid Waste and Emergency Response. Washington, D.C. March 25, 1991. OSWER Directive 9285.6-03.

USEPA, 1990. *National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule.* Federal Register, 40 Code of Federal Regulations Part 300, March 8, 1990.

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

Van Staalen, N.M., and R.A. Verwij. 1991. Effects of benzo(a)pyrene on food assimilation and growth efficiency in *Porcellio scaber* (Isopoda). *Bull. Environ. Contam. Toxicol.* 46:134-140.

Capito, Bonnie P. CIV Env Program Mgmt EV32

ɔm: Cole, Linda L CIV Env Engineering
nt: Thursday, April 08, 2004 1:24 PM
ı o: Capito, Bonnie P. CIV Env Program Mgmt EV32
Subject: FW: CAX Site 12 Technical Memorandum

Final Site 12 Technical Memora... Final Site 12 Tech Memo Attach...

AR. Cheatham Annex, Site 12 - Disposal Site Near Water Tower - Technical Memorandum (to support a no further action recommendation).

-----Original Message-----
From: Shana Conley [mailto:sconley@mbakercorp.com]
Sent: Tuesday, March 30, 2004 13:28
To: mmullen@adelphia.net; Cole, Linda L CIV Env Engineering; BlackwellWC@PWCNORVA.NAVY.MIL
Cc: Don Joiner; Mary E. Smith
Subject: CAX Site 12 Technical Memorandum

Attached please find the Technical Memorandum for CAX Site 12.

TABLES

TABLE 1-1
FREQUENCY AND RANGE OF SURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				Railroad Background (Soil Groups 2 and 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Volatiles (ug/kg)																	
1,1,1-Trichloroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,1,2,2-Tetrachloroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,1,2-Trichloro-1,2,2-trifluoroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
1,1,2-Trichloroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,1-Dichloroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,1-Dichloroethene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,2,4-Trichlorobenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	340U - 6700U	448	Not Detected
1,2-Dibromo-3-chloropropane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
1,2-Dibromoethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
1,2-Dichlorobenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	340U - 6700U	448	Not Detected
1,2-Dichloroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,2-Dichloropropane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
1,3-Dichlorobenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	340U - 6700U	448	Not Detected
1,4-Dichlorobenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	340U - 6700U	448	Not Detected
2-Hexanone	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Acetone	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	2/12	8J - 13	10U - 12U	6.25	Not Detected
Benzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Bromodichloromethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Bromoform	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Bromomethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Carbon disulfide	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Carbon tetrachloride	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Chlorobenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Chloroethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Chloroform	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Chloromethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
cis-1,2-Dichloroethene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
cis-1,3-Dichloropropene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Cyclohexane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---					Not Detected
Dibromochloromethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Dichlorodifluoromethane	0/5	NA	11UJ - 11UJ	5.50	0/3	NA	11UJ - 11UJ	5.50	---	---	---	---	---	---	---	---	Not Detected
Ethylbenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Isopropylbenzene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
Methyl Acetate	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
Volatiles (ug/kg)																	
Methyl Ethyl Ketone	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Methyl isobutyl ketone	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Methyl tert-butyl ether	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
Methylcyclohexane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---	---	Not Detected
Methylene chloride	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	2/12	7J - 9J	10U - 12U	5.83	Not Detected
Styrene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Tetrachloroethene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Toluene	1/5	1J - 1J	2B - 3B	1.10	0/3	NA	2B - 2B	1.00					0/12	NA	10U - 12U	5.46	**Maximum in Site**
trans-1,2-Dichloroethene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
trans-1,3-Dichloropropene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Trichloroethene	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Trichlorofluoromethane	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	---	---	---		Not Detected
Vinyl chloride	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected
Xylenes	0/5	NA	11U - 11U	5.50	0/3	NA	11U - 11U	5.50	---	---	---	---	0/12	NA	10U - 12U	5.46	Not Detected

TABLE 1-1
FREQUENCY AND RANGE OF SURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				Railroad Background (Soil Groups 2 and 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Semivolatiles (ug/kg)																	Not Detected
2,2'-Oxybis(1-chloropropane)	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2,4,5-Trichlorophenol	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
2,4,6-Trichlorophenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2,4-Dichlorophenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2,4-Dimethylphenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2,4-Dinitrophenol	0/5	NA	910UJ - 930UJ	458	0/3	NA	910UJ - 920UJ	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
2,4-Dinitrotoluene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	193	0/12	NA	340U - 6700U	448	Not Detected
2,6-Dinitrotoluene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	193	0/12	NA	340U - 6700U	448	Not Detected
2-Chloronaphthalene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2-Chlorophenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2-Methylnaphthalene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2-Methylphenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
2-Nitroaniline	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
2-Nitrophenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
3,3'-Dichlorobenzidine	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
3-Nitroaniline	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
4,6-Dinitro-2-methylphenol	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
4-Bromophenyl phenyl ether	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
4-Chloro-3-methylphenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
4-Chloroaniline	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
4-Chlorophenylphenylether	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
4-Methylphenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
4-Nitroaniline	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
4-Nitrophenol	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
Acenaphthene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Acenaphthylene	0/5	NA	360U - 370U	182	1/3	15J - 15J	370U - 370U	128	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Acetophenone	0/5	NA	12B - 370U	147	0/3	NA	360U - 370U	183	1/11	110J - 110J	360U - 410U	180	0/0	NA	NA		Not Detected
Anthracene	0/5	NA	360U - 370U	182	1/3	19J - 19J	370U - 370U	130	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Atrazine	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360UJ - 410UJ	187	0/0	NA	NA		Not Detected
Benzaldehyde	0/5	NA	360U - 370U	182	0/3	NA	5B - 370U	124	0/11	NA	360U - 410U	187	0/0	NA	NA		Not Detected
Benzo(a)anthracene	0/5	NA	360U - 370U	182	1/3	140J - 140J	370U - 370U	170	0/11	NA	360U - 410U	186	2/12	120J - 240J	340U - 6700U	446	Not Detected
Benzo(a)pyrene	0/5	NA	360U - 370U	182	1/3	140J - 140J	370U - 370U	170	0/11	NA	360U - 410U	183	2/12	140J - 180J	340U - 6700UJ	443	Not Detected
Benzo(b)fluoranthene	0/5	NA	360U - 370U	182	1/3	350J - 350J	370U - 370U	240	0/11	NA	360U - 410U	232	3/12	230J - 500	340U - 6700UJ	500	Not Detected
Benzo(g,h,i)perylene	0/5	NA	360U - 370U	182	1/3	77J - 77J	370U - 370U	149	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700UJ	448	Not Detected
Benzo(k)fluoranthene	0/5	NA	360U - 370U	182	1/3	310J - 310J	370U - 370U	227	0/11	NA	360U - 410U	178	2/12	120J - 130J	340U - 6700UJ	437	Not Detected
Biphenyl	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	187	0/0	NA	NA		Not Detected
Bis(2-chloroethoxy)methane	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Bis(2-chloroethyl)ether	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Bis(2-ethylhexyl)phthalate	0/5	NA	36B - 130B	33	1/3	600 - 600	28B - 75B	217	7/11	130J - 600	360U - 370U	251	0/12	NA	340U - 6700U	448	Not Detected
Butylbenzylphthalate	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Caprolactam	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	187	0/0	NA	NA		Not Detected
Carbazole	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Chrysene	0/5	NA	360U - 370U	182	1/3	250J - 250J	370U - 370U	207	0/11	NA	360U - 410U	196	3/12	150J - 270J	340U - 6700U	455	Not Detected
Di-n-butylphthalate	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340UJ - 6700U	448	Not Detected
Di-n-octyl phthalate	1/5	38J - 38J	360U - 370U	153	2/3	27J - 33J	370U - 370U	82	0/11	NA	360U - 410U	188	0/12	NA	340UJ - 6700UJ	448	**Maximum in Site**
Dibenzo(a,h)anthracene	0/5	NA	360U - 370U	182	1/3	37J - 37J	370U - 370U	136	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700UJ	448	Not Detected
Dibenzofuran	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Diethylphthalate	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Dimethylphthalate	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Fluoranthene	0/5	NA	360U - 370U	182	1/3	370 - 370	370U - 370U	247	0/11	NA	360U - 410U	203	4/12	120J - 430	340U - 6700U	466	Not Detected
Fluorene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Hexachlorobenzene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected

TABLE 1-1
FREQUENCY AND RANGE OF SURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				Railroad Background (Soil Groups 2 and 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Semivolatiles (ug/kg)																	
Hexachlorobutadiene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Hexachlorocyclopentadiene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Hexachloroethane	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Indeno(1,2,3-cd)pyrene	0/5	NA	360U - 370U	182	1/3	93J - 93J	370U - 370U	154	0/11	NA	360U - 410U	186	1/12	160J - 160J	340U - 6700UJ	446	Not Detected
Isophorone	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
N-Nitroso-di-n-propylamine	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
N-Nitrosodiphenylamine	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Naphthalene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Nitrobenzene	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Pentachlorophenol	0/5	NA	910U - 930U	458	0/3	NA	910U - 920U	458	0/11	NA	900U - 1000U	466	0/12	NA	820U - 16000U	1075	Not Detected
Phenanthrene	0/5	NA	360U - 370U	182	1/3	20J - 20J	370U - 370U	130	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Phenol	0/5	NA	360U - 370U	182	0/3	NA	360U - 370U	183	0/11	NA	360U - 410U	188	0/12	NA	340U - 6700U	448	Not Detected
Pyrene	0/5	NA	360U - 370U	182	1/3	660 - 660	370U - 370U	343	0/11	NA	360U - 410U	198	3/12	160J - 320J	340U - 6700U	458	Not Detected
Pesticides (ug/kg)																	
4,4'-DDD	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	0/11	NA	3.6U - 4.1U	1.87	0/12	NA	3.4U - 4.2U	1.84	Not Detected
4,4'-DDE	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	1/11	1.3J - 1.3J	3.6U - 4.1U	1.83	0/12	NA	3.4U - 4.2U	1.84	Not Detected
4,4'-DDT	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	0/11	NA	3.6U - 4.1U	1.87	0/12	NA	3.4U - 4.2U	1.84	Not Detected
Aldrin	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	0/11	NA	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
alpha-BHC	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	0/11	NA	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
alpha-Chlordane	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	7/11	0.65J - 1.7J	1.8U - 2U	1.01	0/12	NA	1.7U - 2.1U	0.92	Not Detected
beta-BHC	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	1/11	0.94J - 0.94J	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
delta-BHC	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	0/11	NA	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
Dieldrin	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	2/11	3.3J - 4.4J	3.6U - 4.1U	2.17	0/12	NA	3.4U - 4.2U	1.84	Not Detected
Endosulfan I	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	0/11	NA	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
Endosulfan II	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	0/11	NA	3.6U - 4.1U	1.87	0/12	NA	3.4U - 4.2U	1.84	Not Detected
Endosulfan sulfate	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	2/11	2.3J - 2.4J	3.6U - 3.9U	1.93	0/12	NA	3.4U - 4.2U	1.84	Not Detected
Endrin	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	0/11	NA	3.6U - 4.1U	1.87	0/12	NA	3.4U - 4.2U	1.84	Not Detected
Endrin aldehyde	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	2/11	1.2J - 2.7J	3.6U - 3.9U	1.87	0/12	NA	3.4U - 4.2U	1.84	Not Detected
Endrin ketone	0/5	NA	3.6U - 3.7U	1.82	0/3	NA	3.6U - 3.7U	1.83	3/11	1.2J - 2.1J	3.6U - 3.9U	1.82	0/12	NA	3.4U - 4.2U	1.84	Not Detected
gamma-BHC (Lindane)	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	0/11	NA	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
gamma-Chlordane	0/5	NA	1.9U - 1.9U	0.95	1/3	6J - 6J	1.9U - 1.9U	2.63	1/11	0.65J - 0.65J	1.8U - 2U	0.92	0/12	NA	1.7U - 2.1U	0.92	Not Detected
Heptachlor	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	0/11	NA	1.8U - 2.1U	0.95	0/12	NA	1.7U - 2.1U	0.92	Not Detected
Heptachlor epoxide	0/5	NA	1.9U - 1.9U	0.95	0/3	NA	1.9U - 1.9U	0.95	1/11	1.8J - 1.8J	1.8U - 2U	1.01	0/12	NA	1.7U - 2.1U	0.92	Not Detected
Methoxychlor	0/5	NA	19U - 19U	9.50	0/3	NA	19U - 19U	9.50	0/11	NA	18U - 21U	9.54	0/12	NA	17U - 21U	9.21	Not Detected
Toxaphene	0/5	NA	190U - 190U	95.00	0/3	NA	190U - 190U	95.00	0/11	NA	180U - 210U	95.38	0/12	NA	170U - 210U	92.08	Not Detected
PCBs (ug/kg)																	
Aroclor-1016	0/5	NA	36U - 37U	18.20	0/3	NA	36U - 37U	18.33	0/11	NA	36U - 41U	18.69	0/12	NA	34U - 42U	18.42	Not Detected
Aroclor-1221	0/5	NA	74U - 75U	37.10	0/3	NA	74U - 74U	37.00	0/11	NA	73U - 84U	37.77	0/12	NA	68U - 83U	36.88	Not Detected
Aroclor-1232	0/5	NA	36U - 37U	18.20	0/3	NA	36U - 37U	18.33	0/11	NA	36U - 41U	18.69	0/12	NA	34U - 42U	18.42	Not Detected
Aroclor-1242	0/5	NA	36U - 37U	18.20	0/3	NA	36U - 37U	18.33	0/11	NA	36U - 41U	18.69	0/12	NA	34U - 42U	18.42	Not Detected
Aroclor-1248	0/5	NA	36U - 37U	18.20	0/3	NA	36U - 37U	18.33	0/11	NA	36U - 41U	18.69	0/12	NA	34U - 42U	18.42	Not Detected
Aroclor-1254	0/5	NA	36U - 37U	18.20	0/3	NA	36U - 37U	18.33	0/11	NA	36U - 41U	18.69	0/12	NA	34U - 42U	18.42	Not Detected
Aroclor-1260	0/5	NA	36U - 37U	18.20	0/3	NA	36U - 37U	18.33	0/11	NA	36U - 41U	18.69	0/12	NA	34U - 42U	18.42	Not Detected
Metals (mg/kg)																	
Aluminum	5/5	6720 - 11400	NA	8694	3/3	6190 - 9680	NA	7723	11/11	3110 - 6160	NA	5188	12/12	2690 - 24100	NA	10760.83	Maximum in Railroad Background
Antimony	0/5	NA	0.46UL - 0.49UL	0.24	0/3	NA	0.44UL - 0.48UL	0.23	0/11	NA	0.35UL - 0.4UL	2.68	0/8	NA	7.5UL - 9.2UL	4.04	Not Detected
Arsenic	0/5	NA	0.79B - 1.5B	0.52	0/3	NA	0.54B - 0.95B	0.39	11/11	0.094J - 1.7J	NA	2.11	12/12	1L - 14.8	NA	4.79	Not Detected
Barium	5/5	13J - 21.3J	NA	17.80	3/3	12J - 42.3J	NA	22.63	11/11	6J - 46.4	NA	27.51	12/12	10.6J - 39.6J	NA	22.61	Maximum in Background
Beryllium	0/5	NA	0.11B - 0.18B	0.07	0/3	NA	0.082B - 0.17B	0.06	0/11	NA	0.088U - 0.63B	0.24	6/12	0.28J - 0.55J	0.2U - 0.23U	0.25	Not Detected
Cadmium	0/5	NA	0.083U - 0.088U	0.04	0/3	NA	0.081U - 0.087U	0.04	0/11	NA	0.082U - 0.094U	0.34	0/12	NA	1U - 1.4U	0.55	Not Detected

TABLE 1-1
FREQUENCY AND RANGE OF SURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				Railroad Background (Soil Groups 2 and 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Metals (mg/kg)																	
Calcium	5/5	230J - 761J	NA	483	3/3	311J - 548J	NA	408	11/11	45.8J - 925J	NA	442	12/12	90.7J - 4320	NA	950.73	Maximum in Railroad Background
Chromium	5/5	6.4 - 9.9	NA	7.26	3/3	5.3 - 7.5	NA	6.13	11/11	2.7 - 9	NA	6.36	12/12	3.5 - 33.5	NA	13.72	Maximum in Railroad Background
Cobalt	5/5	0.89J - 3.1J	NA	1.54	3/3	0.63J - 2.1J	NA	1.58	7/11	0.56J - 5.3J	0.15U - 0.94B	2.11	11/12	0.88J - 3J	0.82U - 0.82U	1.97	Maximum in Background
Copper	5/5	6.5 - 8.9	NA	7.60	3/3	4.9J - 7	NA	6.17	11/11	0.9J - 1.7J	NA	1.66	12/12	1.2J - 7.3	NA	3.54	**Maximum in Site**
Cyanide, total	0/5	NA	0.032U - 0.036B	0.02	0/3	NA	0.033U - 0.036B	0.02	0/11	NA	0.041U - 0.064B	0.16	0/8	NA	0.49U - 0.71UL	0.28	Not Detected
Iron	5/5	5710 - 8950	NA	6932	3/3	4640 - 8250	NA	6113	11/11	2150 - 8240	NA	4846	12/12	2070 - 46400	NA	14030.83	Maximum in Railroad Background
Lead	5/5	5.4K - 7.3K	NA	6.14	3/3	5.3K - 7.9K	NA	6.30	11/11	6.7 - 12.2	NA	12.22	12/12	2.1 - 16.7L	NA	7.31	Maximum in Railroad Background
Magnesium	5/5	248J - 322J	NA	281	3/3	219J - 298J	NA	251	10/11	137J - 237J	197B - 197B	281	12/12	175J - 2700	NA	869.00	Maximum in Railroad Background
Manganese	5/5	32J - 80.2J	NA	50.92	3/3	8.2J - 33.6J	NA	24.20	11/11	19.2 - 278	NA	101	12/12	8.7 - 161	NA	45.91	Maximum in Background
Mercury	0/5	NA	0.075B - 0.098B	0.04	0/3	NA	0.083B - 0.096B	0.04	1/11	0.097J - 0.097J	0.041U - 0.055U	0.03	1/12	0.05J - 0.05J	0.05U - 0.07U	0.03	Not Detected
Nickel	5/5	2.2J - 3.5J	NA	2.74	3/3	1.6J - 2.9J	NA	2.40	8/11	1.7J - 4.4J	1B - 1.4B	4.01	6/12	4.2J - 12.5	3.2U - 3.7U	4.63	Maximum in Railroad Background
Potassium	5/5	229J - 322J	NA	257	3/3	207J - 339J	NA	255	1/11	307J - 307J	86.8B - 207B	206	7/12	387J - 1390	318U - 353U	567.17	Maximum in Railroad Background
Selenium	1/5	0.63J - 0.63J	0.43UL - 0.46UL	0.31	0/3	NA	0.42UL - 0.46UL	0.22	1/11	0.65J - 0.65J	0.57UL - 0.65UL	0.29	6/12	0.21L - 0.61L	0.2UL - 0.23UL	0.24	Maximum in Background
Silver	0/5	NA	0.1U - 0.11U	0.05	0/3	NA	0.1U - 0.11U	0.05	0/11	NA	0.1U - 0.12U	0.29	2/12	1J - 1.8J	0.81U - 1U	0.60	Not Detected
Sodium	5/5	36.3J - 70J	NA	57.22	3/3	52.1J - 54.9J	NA	53.03	0/11	NA	114B - 197B	51.12	12/12	12J - 98.2J	NA	52.20	Maximum in Railroad Background
Thallium	0/5	NA	0.46UL - 0.49UL	0.24	0/3	NA	0.44UL - 0.48UL	0.23	0/11	NA	0.84UL - 0.96UL	0.26	0/12	NA	0.2U - 0.29U	0.11	Not Detected
Vanadium	5/5	12.2 - 16.7	NA	13.52	3/3	10.5J - 17.9	NA	13.03	11/11	5J - 22.1	NA	12.72	12/12	5.2J - 64.7	NA	25.57	Maximum in Railroad Background
Zinc	5/5	6.4K - 9.8	NA	7.74	3/3	5.3K - 10.2	NA	7.43	11/11	3.6J - 12.2	NA	10.93	12/12	4.9 - 20.1	NA	12.23	Maximum in Railroad Background

TABLE 1-2
FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Volatiles (ug/kg)													
1,1,1-Trichloroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,1,2,2-Tetrachloroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,1,2-Trichloro-1,2,2-trifluoroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,1,2-Trichloroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,1-Dichloroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,1-Dichloroethene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,2,4-Trichlorobenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,2-Dibromo-3-chloropropane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,2-Dibromoethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,2-Dichlorobenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,2-Dichloroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,2-Dichloropropane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,3-Dichlorobenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
1,4-Dichlorobenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
2-Hexanone	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Acetone	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	7B - 12U	5.25	Not Detected
Benzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Bromodichloromethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Bromoform	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Bromomethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Carbon disulfide	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Carbon tetrachloride	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Chlorobenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Chloroethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Chloroform	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Chloromethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
cis-1,2-Dichloroethene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
cis-1,3-Dichloropropene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Cyclohexane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Dibromochloromethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Dichlorodifluoromethane	0/5	NA	11UJ - 12UJ	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Ethylbenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Isopropylbenzene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Methyl Acetate	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Methyl isobutyl ketone	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Methyl tert-butyl ether	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	---	---	---	---	Not Detected
Methylcyclohexane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Methylene chloride	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	1/10	1J - 1J	11U - 12U	5.10	Not Detected
Styrene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	1/10	4J - 4J	11U - 12U	5.40	Not Detected
Volatiles (ug/kg)													
Tetrachloroethene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Toluene	0/5	NA	1B - 2B	0.90	3/3	1J - 1J	NA	1.00	0/10	NA	11U - 12U	5.55	Not Detected
trans-1,2-Dichloroethene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
trans-1,3-Dichloropropene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Trichloroethene	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Trichlorofluoromethane	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected

TABLE 1-2
FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Volatiles (ug/kg)													
Vinyl chloride	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Xylenes	0/5	NA	11U - 12U	5.60	0/3	NA	11U - 12U	5.67	0/10	NA	11U - 12U	5.55	Not Detected
Semivolatiles (ug/kg)													
2,2'-Oxybis(1-chloropropane)	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2,4,5-Trichlorophenol	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980U	459	Not Detected
2,4,6-Trichlorophenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2,4-Dichlorophenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2,4-Dimethylphenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2,4-Dinitrophenol	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980U	459	Not Detected
2,4-Dinitrotoluene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2,6-Dinitrotoluene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2-Chloronaphthalene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2-Chlorophenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2-Methylnaphthalene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2-Methylphenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
2-Nitroaniline	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980U	459	Not Detected
2-Nitrophenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
3,3'-Dichlorobenzidine	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
3-Nitroaniline	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980U	459	Not Detected
4,6-Dinitro-2-methylphenol	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980U	459	Not Detected
4-Bromophenyl phenyl ether	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
4-Chloro-3-methylphenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
4-Chloroaniline	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
4-Chlorophenylphenylether	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
4-Methylphenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
4-Nitroaniline	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980U	459	Not Detected
4-Nitrophenol	0/5	NA	930U - 980U	474	0/3	NA	930U - 970U	475	0/10	NA	870U - 980UJ	459	Not Detected
Acenaphthene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Acenaphthylene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Acetophenone	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Anthracene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Atrazine	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350UJ - 390UJ	183	Not Detected
Benzaldehyde	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Benzo(a)anthracene	0/5	NA	370U - 390U	190	1/3	41J - 41J	380U - 380U	140	0/10	NA	350U - 390U	183	Not Detected
Benzo(a)pyrene	0/5	NA	370U - 390U	190	1/3	46J - 46J	380U - 380U	142	0/10	NA	350U - 390U	183	Not Detected
Benzo(b)fluoranthene	0/5	NA	370U - 390U	190	1/3	97J - 97J	380U - 380U	159	0/10	NA	350U - 390U	183	Not Detected
Benzo(g,h,i)perylene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Benzo(k)fluoranthene	0/5	NA	370U - 390U	190	1/3	96J - 96J	380U - 380U	159	0/10	NA	350U - 390U	183	Not Detected
Biphenyl	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Bis(2-chloroethoxy)methane	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Bis(2-chloroethyl)ether	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Bis(2-ethylhexyl)phthalate	1/5	570 - 570	43B - 330B	162	1/3	320J - 320J	51B - 100B	132	3/10	41J - 140J	37B - 380U	125	**Maximum in Site**
Butylbenzylphthalate	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Caprolactam	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Carbazole	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected

TABLE 1-2
FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
Semivolatiles (ug/kg)													
Chrysene	0/5	NA	370U - 390U	190	1/3	82J - 82J	380U - 380U	154	0/10	NA	350U - 390U	183	Not Detected
Di-n-butylphthalate	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Di-n-octyl phthalate	1/5	15J - 15J	370U - 390U	155	1/3	25J - 25J	380U - 380U	135	0/10	NA	350U - 390U	183	Maximum in Upgradient
Dibenzo(a,h)anthracene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Dibenzofuran	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Diethylphthalate	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Dimethylphthalate	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Fluoranthene	0/5	NA	370U - 390U	190	1/3	110J - 110J	380U - 380U	163	0/10	NA	350U - 390U	183	Not Detected
Fluorene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Hexachlorobenzene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Hexachlorobutadiene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Hexachlorocyclopentadiene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Hexachloroethane	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Indeno(1,2,3-cd)pyrene	0/5	NA	370U - 390U	190	1/3	33J - 33J	380U - 380U	138	0/10	NA	350U - 390U	183	Not Detected
Isophorone	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
N-Nitroso-di-n-propylamine	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
N-Nitrosodiphenylamine	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Naphthalene	1/5	33J - 33J	370U - 380U	158	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	**Maximum in Site**
Nitrobenzene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Pentachlorophenol	0/5	NA	930U - 980U	474	0/3	NA	940U - 970U	477	0/10	NA	870U - 980U	459	Not Detected
Phenanthrene	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Phenol	0/5	NA	370U - 390U	190	0/3	NA	380U - 380U	190	0/10	NA	350U - 390U	183	Not Detected
Pyrene	0/5	NA	370U - 390U	190	1/3	140J - 140J	380U - 380U	173	0/10	NA	350U - 390U	183	Not Detected
Pesticides (ug/kg)													
4,4'-DDD	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	1/10	3.1J - 3.1J	3.5U - 3.9U	1.96	Not Detected
4,4'-DDE	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
4,4'-DDT	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
Aldrin	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
alpha-BHC	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
alpha-Chlordane	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	2/10	2.4J - 4.7	1.8U - 2U	1.46	Not Detected
beta-BHC	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
delta-BHC	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
Dieldrin	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	1/10	2.3J - 2.3J	3.5U - 3.9U	1.88	Not Detected
Endosulfan I	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
Endosulfan II	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
Endosulfan sulfate	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
Endrin	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
Endrin aldehyde	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
Endrin ketone	0/5	NA	3.7U - 3.9U	1.90	0/3	NA	3.8U - 3.8U	1.90	0/10	NA	3.5U - 3.9U	1.84	Not Detected
gamma-BHC (Lindane)	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
gamma-Chlordane	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
Heptachlor	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
Heptachlor epoxide	0/5	NA	1.9U - 2U	0.97	0/3	NA	1.9U - 2U	0.98	0/10	NA	1.8U - 2U	0.94	Not Detected
Methoxychlor	0/5	NA	19U - 20U	9.70	0/3	NA	19U - 20U	9.83	0/10	NA	18U - 20U	9.35	Not Detected
Toxaphene	0/5	NA	190U - 200U	97.00	0/3	NA	190U - 200U	98.33	0/10	NA	180U - 200U	93.50	Not Detected

TABLE 1-2
FREQUENCY AND RANGE OF SUBSURFACE SOIL DATA COMPARED TO VALUES MEASURED IN REFERENCE AREAS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

	Site 12				Upgradient (Collected Near RR Tracks)				CAX Background (Soil Group 3)				
Analyte	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	No. of Positive Detects/No. of Samples	Range of Positive Detections	Range of Non-Detects	Arithmetic Mean (Half Non-Detects)	Location of Maximum Detection
PCBs (ug/kg)													
Aroclor-1016	0/5	NA	37U - 39U	19.00	0/3	NA	38U - 38U	19.00	0/10	NA	35U - 39U	18.35	Not Detected
Aroclor-1221	0/5	NA	75U - 79U	38.30	0/3	NA	76U - 78U	38.50	0/10	NA	70U - 79U	37.05	Not Detected
Aroclor-1232	0/5	NA	37U - 39U	19.00	0/3	NA	38U - 38U	19.00	0/10	NA	35U - 39U	18.35	Not Detected
Aroclor-1242	0/5	NA	37U - 39U	19.00	0/3	NA	38U - 38U	19.00	0/10	NA	35U - 39U	18.35	Not Detected
Aroclor-1248	0/5	NA	37U - 39U	19.00	0/3	NA	38U - 38U	19.00	0/10	NA	35U - 39U	18.35	Not Detected
Aroclor-1254	0/5	NA	37U - 39U	19.00	0/3	NA	38U - 38U	19.00	0/10	NA	35U - 39U	18.35	Not Detected
Aroclor-1260	0/5	NA	37U - 39U	19.00	0/3	NA	38U - 38U	19.00	0/10	NA	35U - 39U	18.35	Not Detected
Metals (mg/kg)													
Aluminum	5/5	4550 - 7300	NA	5604	3/3	3990 - 6780	NA	4983	10/10	1920 - 10900	NA	5633	Maximum in Background
Antimony	0/5	NA	0.49UL - 0.5UL	0.25	0/3	NA	0.47UL - 0.5UL	0.24	0/10	NA	0.35U - 0.38U	0.18	Not Detected
Arsenic	0/5	NA	0.46U - 1.3B	0.43	0/3	NA	0.44U - 0.67B	0.26	1/10	2.1 - 2.1	0.4B - 1.5B	0.69	Not Detected
Barium	5/5	5.8J - 11.9J	NA	8.02	3/3	5.3J - 14.7J	NA	9.10	10/10	8.2J - 47.8	NA	25.53	Maximum in Upgradient
Beryllium	0/5	NA	0.044U - 0.14B	0.03	0/3	NA	0.044U - 0.047B	0.02	0/10	NA	0.1B - 0.66B	0.13	Not Detected
Cadmium	0/5	NA	0.089U - 0.091U	0.05	0/3	NA	0.086U - 0.091U	0.04	0/10	NA	0.082U - 0.09U	0.04	Not Detected
Calcium	5/5	214J - 876J	NA	494	3/3	160J - 583J	NA	421	9/10	56.4J - 304J	42.3B - 42.3B	143	**Maximum in Site**
Chromium	5/5	5.5 - 8	NA	6.94	3/3	4 - 9.9	NA	6.50	10/10	2.9 - 15.6	NA	7.27	Maximum in Upgradient
Cobalt	3/5	0.16J - 0.36J	0.15U - 0.16U	0.20	1/3	0.2J - 0.2J	0.15U - 0.16U	0.12	7/10	0.84J - 8.1J	0.16U - 0.92B	2.17	Maximum in Background
Copper	5/5	3.6J - 5.2J	NA	4.42	3/3	3.8J - 4.4J	NA	4.07	9/10	0.71J - 2.4J	0.59B - 0.59B	1.26	**Maximum in Site**
Cyanide, total	0/5	NA	0.032U - 0.094B	0.02	0/3	NA	0.033U - 0.033U	0.02	0/10	NA	0.04B - 0.44B	0.05	Not Detected
Iron	5/5	3740J - 9100J	NA	6524	3/3	2830J - 6940J	NA	4480	10/10	1740 - 12500	NA	6602	Maximum in Background
Lead	5/5	4.1 - 5	NA	4.66	3/3	4.4 - 5.5	NA	4.97	10/10	3.2 - 6.7	NA	5.21	Maximum in Upgradient
Magnesium	3/5	217J - 243J	161B - 193B	174	1/3	281J - 281J	143B - 154B	143	10/10	115J - 392J	NA	242	Maximum in Upgradient
Manganese	5/5	2.8J - 11.2J	NA	6.00	3/3	2.4J - 3.6J	NA	3.00	10/10	5.4 - 208	NA	46.68	Maximum in Background
Mercury	0/5	NA	0.077B - 0.11B	0.04	0/3	NA	0.093B - 0.098B	0.05	0/10	NA	0.036UL - 0.056UL	0.02	Not Detected
Nickel	5/5	0.49J - 1.8J	NA	0.89	3/3	0.36J - 0.67J	NA	0.48	8/10	1.8J - 6.4J	0.99B - 1.1B	2.39	Maximum in Background
Potassium	2/5	240J - 271J	189B - 215B	164	1/3	228J - 228J	146B - 201B	134	1/10	278J - 278J	78.8B - 253B	104	Maximum in Background
Selenium	0/5	NA	0.48U - 0.63B	0.26	0/3	NA	0.48U - 0.93B	0.35	0/10	NA	0.58UL - 0.63UL	0.30	Not Detected
Silver	0/5	NA	0.11U - 0.11U	0.06	0/3	NA	0.11U - 0.11U	0.06	0/10	NA	0.1UL - 0.11UL	0.05	Not Detected
Sodium	5/5	44.7J - 65.2J	NA	51.24	3/3	37.9J - 67.5J	NA	55.10	0/10	NA	135B - 217B	94.85	Maximum in Upgradient
Thallium	0/5	NA	0.49U - 0.5U	0.25	0/3	NA	0.47U - 0.5U	0.24	0/10	NA	0.84UL - 0.92UL	0.44	Not Detected
Vanadium	5/5	15 - 20.8	NA	17.50	3/3	13.2 - 33.5	NA	21.43	10/10	3.4J - 36	NA	13.42	Maximum in Upgradient
Zinc	4/5	3.4J - 10.6	1.9B - 1.9B	4.69	3/3	2.6J - 13.9	NA	6.47	9/10	5L - 13.8	4B - 4B	6.83	Maximum in Upgradient

TABLE 1-3
SUMMARY STATISTICS AND RESULTS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Chemical[1]	Depth	Population	Descriptive Statistics					Distributional Statistics[3]		Proportional Stats[5]	Site 12 Concentrations Elevated?
			Frequency of Detection	Range of Detections	Mean[2]	SE	95% UCL	Mean of the Distribution[4]	Right Tail of the Distribution[6] Slippage Test		
Di-n-octylphthalate	Surface (0 to 6 inches)	Site 12	1/5	38J - 38J	153	28.67	214	---	No Difference	---	No, based on slippage, maximum values, and 95% UCL
		Upgradient	2/3	27J - 33J	81.67	40.04	233				
Copper	Surface (0 to 6 inches)	Site 12	5/5	6.5 - 8.9	7.60	0.45	8.56	t-test, p=0.0544, No Significant Difference	No Difference	NA	No, based on t-test and slippage test
		Upgradient	3/3	4.9J - 7	6.17	0.50	8.05				
Bis(2-ethylhexyl)phthalate	Subsurface (6 to 24 inches)	Site 12	1/5	570 - 570	162	106	387	---	No Difference	Z_p (-0.4216) < $Z_{1-\alpha}$ (1.645), Not a COPC	No, based on slippage and proportional statistics, 95% UCL
		Upgradient	1/3	320J - 320J	132	73.08	407				
Calcium	Subsurface (6 to 24 inches)	Site 12	5/5	214J - 876J	494	131	773	t-test, p=0.3631, No Significant Difference	No Difference	NA	No, based on t-test and slippage test
		Upgradient	3/3	160J - 583J	421	102	806				
Copper	Subsurface (6 to 24 inches)	Site 12	5/5	3.6J - 5.2J	4.42	0.31	5.09	t-test, p=0.2241, No Significant Difference	No Difference	NA	No, based on t-test and slippage test
		Upgradient	3/3	3.8J - 4.4J	4.07	0.14	4.6				

Notes:
1 Units in ug/kg for organics, mg/kg for inorganics
2 Mean based on 1/2 non-detected values.
3 Unless otherwise noted, α=0.05.
4 Normality verified with Shapiro-Wilks test, Homogeneity of variance verified with F-test.
5 Proportional distributions only evluated if censoring of data precluded distributional statistics.

NA = Test Not Applicable
ND = Not Detected
SE = Standard Error
95% UCL = 95% Upper Confidence Limit of the Mean
--- = Indeterminate test due to censoring of data set

TABLE 2-1

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Contaminant		Criteria [1]		Contaminant Frequency / Range / Location			Background [2]	COPC Selection		Exposure Concentration Selection		
		Region III Residential Soil RBC Values		No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	Range of Positive Detects	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL	Exposure Concentration	Rationale for Concentration Selection
Volatiles (ug/kg)												
Toluene		1,564,286	N	1/8	1 J	12SS04-00	ND	NO	BSL	NA	NA	NA
Semivolatiles (ug/kg)												
Acenaphthylene		469,286	N [5]	1/8	15 J	12SS08-00	ND	NO	BSL	NA	NA	NA
Anthracene		2,346,429	N	1/8	19 J	12SS08-00	ND	NO	BSL	NA	NA	NA
Benzo(a)anthracene	*	875	C	1/8	140 J	12SS08-00	ND	YES	CHEM	188	140	Max (4)
Benzo(a)pyrene		87.5	C	1/8	140 J	12SS08-00	ND	YES	ASL	188	140	Max (4)
Benzo(b)fluoranthene	*	875	C	1/8	350 J	12SS08-00	ND	YES	CHEM	243	243	W-Normal (3)
Benzo(g,h,i)perylene		234,643	N [6]	1/8	77 J	12SS08-00	ND	NO	BSL	NA	NA	NA
Benzo(k)fluoranthene	*	8,750	C	1/8	310 J	12SS08-00	ND	YES	CHEM	229	229	W-Normal (3)
Bis(2-ethylhexyl) Phthalate		45,623	C	1/8	600	12SS08-00	130J-600	NO	BSL	NA	NA	NA
Chrysene	*	87,497	C	1/8	250 J	12SS08-00	ND	YES	CHEM	207	207	W-Normal (3)
Dibenz(a,h)anthracene	*	87.5	C	1/8	37 J	12SS08-00	ND	YES	CHEM	199	37	Max (4)
Di-n-octyl Phthalate		156,429	N	3/8	27 J - 38 J	12SS04-00	ND	NO	BSL	NA	NA	NA
Fluoranthene		312,857	N	1/8	370	12SS08-00	ND	NO	BSL	NA	NA	NA
Indeno(1,2,3-cd)pyrene	*	875	C	1/8	93 J	12SS08-00	ND	YES	CHEM	193	93	Max (4)
Phenanthrene		234,643	N [6]	1/8	20 J	12SS08-00	ND	NO	BSL	NA	NA	NA
Pyrene		234,643	N	1/8	660	12SS08-00	ND	NO	BSL	NA	NA	NA
Pesticides/PCBs (ug/kg)												
Chlordane, gamma-		1,825	C [7]	1/8	6 J	12SS08-00	1	NO	BSL	NA	NA	NA
Inorganics (mg/kg)												
Aluminum		7,821	N	8/8	6190 - 11400	12SS04-00	3110 -6160	YES	ASL	9,472	9,472	W-Normal (3)
Barium		548	N	8/8	12 J - 42.3 J	12SS06-00	6J-46.4	NO	BSL	NA	NA	NA
Calcium	+	NE		8/8	230 J - 761 J	12SS04-00	45.8J-925J	NO	NUT	NA	NA	NA
Chromium		23.5	N [8]	8/8	5.3 - 9.9	12SS04-00	2.7 -9	NO	BSL	NA	NA	NA
Cobalt		156	N	8/8	0.63 J - 3.1 J	12SS04-00	0.56J-5.3J	NO	BSL	NA	NA	NA
Copper		313	N	8/8	4.9 J - 8.9	12SS04-00	0.9J-1.7J	NO	BSL	NA	NA	NA
Iron		2,346	N	8/8	4640 - 8950	12SS04-00	2150 -8240	YES	ASL	7,589	7,589	W-Normal (3)
Lead		400	N [9]	8/8	5.3 K - 7.9 K	12SS06-00	6.7 -12.2	NO	BSL	NA	NA	NA
Magnesium	+	NE		8/8	219 J - 322 J	12SS04-00	137J-237J	NO	NUT	NA	NA	NA
Manganese		156	N	8/8	8.2 J - 80.2 J	12SS04-00	19.2 -278	NO	BSL	NA	NA	NA
Nickel		156	N	8/8	1.6 J - 3.5 J	12SS04-00	1.7J-4.4J	NO	BSL	NA	NA	NA

TABLE 2-1 (Continued)

SURFACE SOIL DATA AND COPC SELECTION SUMMARY
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Contaminant	Criteria (1)	Contaminant Frequency / Range / Location			Background (2)	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	Range of Positive Detects	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL	Exposure Concentration	Rationale for Concentration Selection
Inorganics (mg/kg) (Cont)										
Potassium +	NE	8/8	207 J - 339 J	12SS06-00	307	NO	NUT	NA	NA	NA
Selenium	39.1 N	1/8	0.63 J	12SS04-00	1	NO	BSL	NA	NA	NA
Sodium +	NE	8/8	36.3 J - 70 J	12SS04-00	ND	NO	NUT	NA	NA	NA
Vanadium	54.8 N	8/8	10.5 J - 17.9	12SS06-00	5J-22.1	NO	BSL	NA	NA	NA
Zinc	2,346 N	8/8	5.3 K - 10.2	12SS06-00	3.6J-12.2	NO	BSL	NA	NA	NA

Notes:

NA - Not Applicable
ND - Not Detected
NE - Not Established

UCL - Upper Confidence Limit
PRG - Preliminary Remediation Goal
COPC - Chemical of Potential Concern

ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
\+ - Essential Nutrient

C = Carcinogenic
N = Non-Carcinogenic

Rationale Codes:

(ASL) Above Screening Level
(CHEM) Same Chemical Class
(BSL) Below Screening Level
(NUT) Essential Nutrient

J - Analyte present - Reported value is estimated
K - Analyte present - Reported value is biased high

Shaded constituents were identified as COPCs for quantitative risk evaluation.

* These compounds were retained because one or more of its related carcinogenic PAHs were retained, and these compounds are known to exist together in mixtures

(1) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals.
USEPA Region III COC Screening Value (derived from USEPA Region III RBC Table - October, 2002)
(2) Cheatham Annex Background Investigation, draft (Baker, 2002): Range of positive detects
(3) Conservative estimate of the arithmetic average concentration (95% UCL), based on the Shapiro-Wilks (W-) or D-Agostino (D-) distribution tests
(4) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(5) Screening value for acenaphthene used as a surrogate.
(6) Screening value for pyrene used as a surrogate.
(7) Screening value for chlordane used as a surrogate.
(8) Screening value for chromium VI used.
(9) Action level for lead.

TABLE 2-2

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Contaminant	Criteria (1)	Contaminant Frequency / Range / Location			Background (2)	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	Range of Positive Detects	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL	Exposure Concentration	Rationale for Concentration Selection
Volatiles (ug/kg)										
Toluene	1,564,286 N	3/8	1 J - 1 J	12SB06-01,12SB07-01,12SB08-01	ND	NO	BSL	NA	NA	NA
Semivolatiles (ug/kg)										
Benzo(a)anthracene	875 C	1/8	41 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Benzo(a)pyrene	87.5 C	1/8	46 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Benzo(b)fluoranthene	875 C	1/8	97 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Benzo(k)fluoranthene	8,750 C	1/8	96 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Bis(2-ethylhexyl) Phthalate	45,623 C	2/8	320 J - 570	12SB05-01	41J-140J	NO	BSL	NA	NA	NA
Chrysene	87,497 C	1/8	82 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Di-n-octyl Phthalate	156,429 N	2/8	15 J - 25 J	12SB06-01	ND	NO	BSL	NA	NA	NA
Fluoranthene	312,857 N	1/8	110 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Indeno(1,2,3-cd)pyrene	875 C	1/8	33 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Naphthalene	156,429 N	1/8	33 J	12SB02-01	ND	NO	BSL	NA	NA	NA
Pyrene	234,643 N	1/8	140 J	12SB08-01	ND	NO	BSL	NA	NA	NA
Inorganics (mg/kg)										
Aluminum	7,821 N	8/8	3990 - 7300	12SB01-01	1920 -10900	NO	BSL	NA	NA	NA
Barium	548 N	8/8	5.3 J - 14.7 J	12SB06-01	8.2J-47.8	NO	BSL	NA	NA	NA
Calcium +	NE	8/8	160 J - 876 J	12SB05-01	56.4J-304J	NO	NUT	NA	NA	NA
Chromium	23.5 N (4)	8/8	4 - 9.9	12SB07-01	2.9 -15.6	NO	BSL	NA	NA	NA
Cobalt	156 N	4/8	0.16 J - 0.36 J	12SB01-01	0.84J-8.1J	NO	BSL	NA	NA	NA
Copper	313 N	8/8	3.6 J - 5.2 J	12SB01-01	0.71J-2.4J	NO	BSL	NA	NA	NA
Iron	2,346 N	8/8	2830 J - 9100 J	12SB01-01	1740 -12500	YES	ASL	7,359	7,359	W-Normal (3)
Lead	400 N (5)	8/8	4.1 - 5.5	12SB07-01	3.2 -6.7	NO	BSL	NA	NA	NA
Magnesium +	NE	4/8	217 J - 281 J	12SB07-01	115J-392J	NO	NUT	NA	NA	NA
Manganese	156 N	8/8	2.4 J - 11.2 J	12SB04-01	5.4 -208	NO	BSL	NA	NA	NA
Nickel	156 N	8/8	0.36 J - 1.8 J	12SB01-01	1.8J-6.4J	NO	BSL	NA	NA	NA
Potassium +	NE	3/8	228 J - 271 J	12SB01-01	278	NO	NUT	NA	NA	NA
Sodium +	NE	8/8	37.9 J - 67.5 J	12SB07-01	ND	NO	NUT	NA	NA	NA

TABLE 2-2 (Continued)

SUBSURFACE SOIL DATA AND COPC SELECTION SUMMARY
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Contaminant	Criteria (1)	Contaminant Frequency / Range / Location			Background (2)	COPC Selection		Exposure Concentration Selection		
	Region III Residential Soil RBC Values	No. of Positive Detects / No. of Samples	Range of Positive Detections	Location of Maximum Detection	Range of Positive Detects	Selected as a COPC?	Rationale for Selection or Deletion	95% UCL	Exposure Concentration	Rationale for Concentration Selection
Inorganics (mg/kg) (Cont)										
Vanadium	54.8 N	8/8	13.2 - 33.5	12SB07-01	3.4J-36	NO	BSL	NA	NA	NA
Zinc	2,346 N	7/8	2.6 J - 13.9	12SB07-01	5L-13.8	NO	BSL	NA	NA	NA

Notes:

NA - Not Applicable
ND - Not Detected
NE - Not Established
UCL - Upper Confidence Limit
PRG - Preliminary Remediation Goal
COPC - Chemical of Potential Concern
ug/kg - microgram per kilogram
mg/kg - milligram per kilogram
\+ - Essential Nutrient
C = Carcinogenic
N = Non-Carcinogenic

Rationale Codes:

(ASL) Above Screening Level
(BSL) Below Screening Level
(NUT) Essential Nutrient

J - Analyte present - Reported value is estimated

Shaded constituents were identified as COPCs for quantitative risk evaluation.

(1) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals.
USEPA Region III COC Screening Value (derived from USEPA Region III RBC Table - October, 2002)
(2) Cheatham Annex Background Investigation, draft (Baker, 2002): Range of positive detects
(3) Conservative estimate of the arithmetic average concentration (95% UCL), based on the Shapiro-Wilks (W-) or D-Agostino (D-) distribution tests
(4) Screening value for chromium VI used.
(5) Action level for lead.

TABLE 2-3

SUMMARY OF EXPOSURE PARAMETERS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Parameter	Units	Current Adult Trespassers RME	Current Adolescent Trespassers RME	Current Adult On-Site Workers RME	Future Adult Residents RME	Future Young Child Residents RME	Future Adult Industrial / Commercial Workers RME	Future Adult Construction Workers RME
Soil								
Ingestion Rate of Soil / Sediment (IR-S)	mg/day	100 USEPA, 1989	100 USEPA, 1989	50 USEPA, 1991	100 USEPA, 1989	200 USEPA, 1989	100 USEPA, 1993	480 USEPA, 1997
Fraction Ingested from Source (Fi)	NA	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 Prof Judge	1 USEPA, 1995
Exposure Frequency (EF)	days/year	52 Prof Judge	52 Prof Judge	250 USEPA, 1991	350 USEPA, 1991	350 USEPA, 1991	250 USEPA, 2001	250 USEPA, 1991
Exposure Duration (ED)	years	24 USEPA, 1989	9 USEPA, 1991	25 USEPA, 1991	24 USEPA, 1989	6 USEPA, 1989	25 USEPA, 2001	1 Prof Judge
Exposure Time (ET)	hours/day	12 USEPA, 1997	12 USEPA, 1997	8 Prof Judge	24 Prof Judge	24 Prof Judge	8 USEPA, 1991	8 Prof Judge
Surface Area Available for Contact (SA)	cm2/day	5,700 USEPA, 1997	5,300 USEPA, 1997	3,300 USEPA, 1997	5,700 USEPA, 1997	2,800 USEPA, 1997	3,300 USEPA, 2001	3,300 USEPA, 1997
Respiration Rate (RR)	m3/hour	0.83 USEPA, 1991	0.83 USEPA, 1991	0.83 USEPA, 1989	0.83 USEPA, 1991	0.83 Prof Judge	1.1 USEPA, 1997	2.5 USEPA, 1997
Conversion Factor (CF)	kg/mg	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989	1.00E-06 USEPA, 1989
Averaging Time (Non-Cancer) (AT-N)	days	8,760 USEPA, 1989	3,285 USEPA, 1989	9,125 USEPA, 1989	8,760 USEPA, 1989	2,190 USEPA, 1989	9,125 USEPA, 1989	365 USEPA, 1989
Other Parameters								
Body Weight (BW)	kg	70 USEPA, 1989	45 USEPA, 1997	70 USEPA, 1989	70 USEPA, 1989	15 USEPA, 1991	70 USEPA, 1997	70 USEPA, 1989
Soil to Skin Adherence Factor (AF)	mg/cm2	0.07 USEPA, 1997	0.2 USEPA, 1997	0.2 USEPA, 1997	0.07 USEPA, 1997	0.2 USEPA, 1997	0.07 USEPA, 2001	0.2 USEPA, 1997
Particulate Emission Factor (PEF)	m3/kg	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 1995	1.32E+09 Cowherd, et al., 199	1.32E+09 Cowherd, et al., 1995
Averaging Time (Cancer) (AT-C)	days	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989	25,550 USEPA, 1989

Notes:

RME - Reasonalble Maximum Exposure
CT - Central Tendency
ABS - Absorption Factors
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/00
The following USEPA Region III default absorbance factors will be applied in the absence of reference values from USEPA, 2001 to estimate dermal intake of COPCs in soil and sediment (USEPA, 1995):

0.05% and 3.0% - VOAs (chemical	3.2% - Arsenic
1.0% - Inorganics	6.0% - PCBs
3.0% - Dioxins / Furans	10% - SVOAs, Pesticides, Explosives, Herbicides, TPH

Prof Judge - Professional Judgement

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989. Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual (Part A) Interim Fina
USEPA, 1991. Risk Assessment Guidance for Superfund, Volume I - Human Health Evaluation Manual Supplemental Gudiance "Standard Default Exposure Factors."
USEPA, 1993. Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure - Draf
USEPA, 1995. Assessing Dermal Exposure from Soil
USEPA, 1997. Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.

TABLE 2-4

HUMAN HEALTH RISK ASSESSMENT TOXICITY FACTORS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Constituents	Oral CSF $(mg/kg/day)^{-1}$	Inhalation CSF $(mg/kg/day)^{-1}$	Oral RfD $(mg/kg/day)^{-1}$	Inhalation RfD $(mg/kg/day)^{-1}$	Oral Absorption Factors (1)	WOE	Target Organ (Systemic Toxicity)	Critical Effect (Systemic Toxicity)
Semivolatiles								
Benzo(a)anthracene	0.73	NA	NA	NA	0.13	(o) B2, (i) D	NA	NA
Benzo(a)pyrene	7.3	3.1	NA	NA	0.13	B2	NA	NA
Benzo(b)fluoranthene	0.73	NA	NA	NA	0.13	B2	NA	NA
Benzo(k)fluoranthene	0.073	NA	NA	NA	0.13	B2	NA	NA
Chrysene	0.0073	NA	NA	NA	0.13	B2	NA	NA
Dibenz(a,h)anthracene	7.3	NA	NA	NA	0.13	(o) B2, (i) D	NA	NA
Indeno(1,2,3-cd)pyrene	0.73	NA	NA	NA	0.13	B2	NA	NA
Inorganics								
Aluminum	NA	NA	1	0.001	0.01	D	CNS	Developmental problems
Iron	NA	NA	0.3	NA	0.01	D	(o) Liver / CVS / GIS	(o) Liver hemosiderosis and cirrhosis

Notes:

CSF = Cancer Slope Factor
RfD = Reference Dose
WOE = Weight of Evidence

Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

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

Known/Likely (EPA classes A, B1, B2, C)
Cannot be Determined (EPA class D)
Not Likely (EPA class E)

-- = Not Available
(o) = Toxicty due to oral exposure
(i) = Toxicity due to inhalation exposure

(1) - ABS - Absorption Factors
The following USEPA Region III default absorbance factors will be applied in the absence of reference values from USEPA, 2001 to estimate dermal intake of COPCs in soil and sediment in the absence of chemical-specific information (USEPA, 1995):

0.05% and 3.0% - VOAs (chemical speci
1.0% - Inorganics
3.0% - Dioxins / Furans
3.2% - Arsenic
6.0% - PCBs
10% - SVOAs, Pesticides, Explosives, Herbicides, TPH

TABLE 2-5

TOTAL SITE INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICIES (HIs) FOR CURRENT AND FUTURE POTENTIAL HUMAN RECEPTORS SITE 12 (DISPOSAL SITE NEAR WATER TOWER) CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

	Adult		Young Child / Adolescent		Total Lifetime ILCR
Receptors	Total ILCR	Total HI	Total ILCR	Total HI	Total ILCR
Current Adult On-Site Workers	7.9E-07	0.02	--	--	7.9E-07
Future Adult Industrial / Commercial Workers	7.5E-07	0.04	--	--	7.5E-07
Future Adult Construction Workers	1.3E-07	0.28	--	--	1.3E-07
Current Adult and Adolescent Trespassers	1.8E-07	0.01	1.6E-07	0.01	3.4E-07
Future Adult and Young Child Residents - RME	1.2E-06	0.09	2.5E-06	0.79	3.7E-06

Notes:

Shading indicates exceedances of USEPA acceptable target risk criteria

TABLE 2-6
INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ADULT AND ADOLESCENT TRESPASSERS - RME
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

	Current Adult Trespassers		Current Adolescent Trespassers	
Pathway	ILCR	HI	ILCR	HI
Surface Soil				
Ingestion	1.2E-07	0.01	6.7E-08	0.01
Dermal Contact	6.0E-08	0.00	9.3E-08	0.00
Inhalation [(1)]	2.3E-12	0.00	1.3E-12	0.00
Subtotal	1.8E-07	0.01	1.6E-07	0.01
Total	1.8E-07	0.01	1.6E-07	0.01

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures
Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

(1) Inhalation of fugitive dust.

TABLE 2-7
INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR CURRENT ADULT ON-SITE WORKERS - RME
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

	Current Adult On-Site Workers	
Pathway	ILCR	HI
Surface Soil		
Ingestion	2.9E-07	0.02
Dermal Contact	5.0E-07	0.00
Inhalation [1]	7.6E-12	0.00
Subtotal	7.9E-07	0.02
Total	7.9E-07	0.02

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures
Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

(1) Inhalation of fugitive dust.

TABLE 2-8
INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT AND YOUNG CHILD RESIDENTS - RME
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

	Future Adult Residents		Future Young Child Residents		Total Lifetime for Residents
Pathway	ILCR	HI	ILCR	HI	ILCR
Surface Soil					
Ingestion	7.8E-07	0.05	1.8E-06	0.44	2.6E-06
Dermal Contact	4.0E-07	0.00	6.6E-07	0.01	1.1E-06
Inhalation [(1)]	3.1E-11	0.00	3.6E-11	0.01	6.7E-11
Subtotal	1.2E-06	0.05	2.5E-06	0.47	3.7E-06
Subsurface Soil					
Ingestion	--	0.03	--	0.31	--
Dermal Contact	--	0.00	--	0.01	--
Inhalation [(1)]	--	--	--	--	--
Subtotal	--	0.03	--	0.32	--
Total	1.2E-06	0.09	2.5E-06	0.79	3.7E-06

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures
Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

(1) Inhalation of fugitive dust.

TABLE 2-9
INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT INDUSTRIAL / COMMERCIAL WORKERS - RME
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

	Future Adult Industrial / Commercial Workers	
Pathway	ILCR	HI
Surface Soil		
Ingestion	5.8E-07	0.03
Dermal Contact	1.7E-07	0.00
Inhalation [1]	1.0E-11	0.00
Subtotal	7.5E-07	0.04
Total	7.5E-07	0.04

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures
Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

(1) Inhalation of fugitive dust.

TABLE 2-10
INCREMENTAL LIFETIME CANCER RISKS (ILCRs) AND HAZARD INDICES (HIs)
FOR FUTURE ADULT CONSTRUCTION WORKERS - RME
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

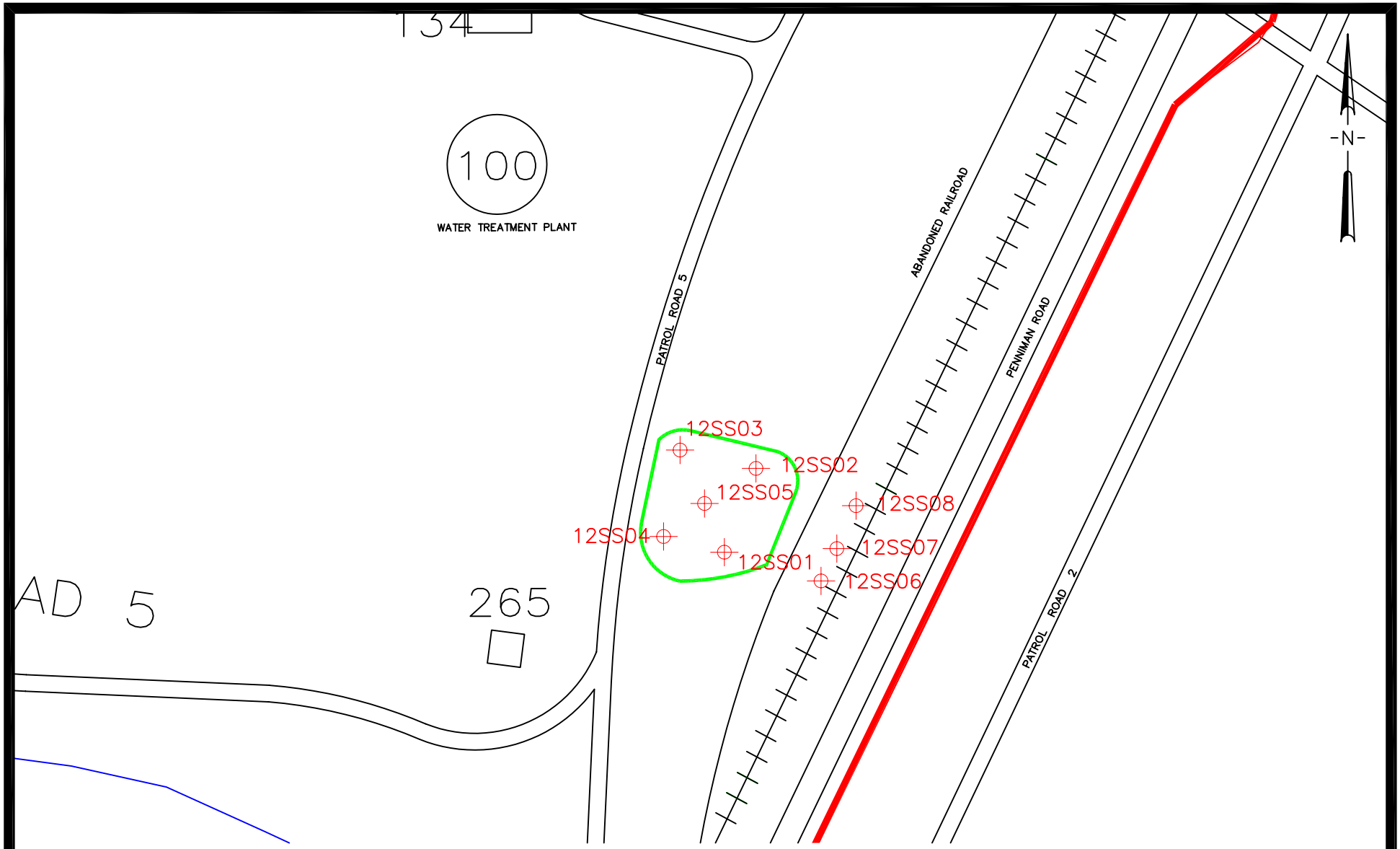
	Future Adult Construction Workers	
Pathway	ILCR	HI
Surface Soil		
Ingestion	1.1E-07	0.16
Dermal Contact	2.0E-08	0.00
Inhalation [(1)]	9.2E-13	0.00
Subtotal	1.3E-07	0.17
Subsurface Soil		
Ingestion	--	0.12
Dermal Contact	--	0.00
Inhalation [(1)]	--	--
Subtotal	--	0.12
Total	1.3E-07	0.28

Notes:

Bolding indicates exceedances of USEPA acceptable target risk criteria by pathway exposures
Shading indicates exceedances of USEPA acceptable target risk criteria by subtotal and total risk value

(1) Inhalation of fugitive dust.

FIGURES



100 0 50 100

1 inch = 100 ft.

LEGEND

- WATER BOUNDARY OR DRAINAGE
- ROADWAY
- INSTALLATION BOUNDARY
- RAILROAD
- SAMPLING LOCATION
- APPROXIMATE SITE BOUNDARY

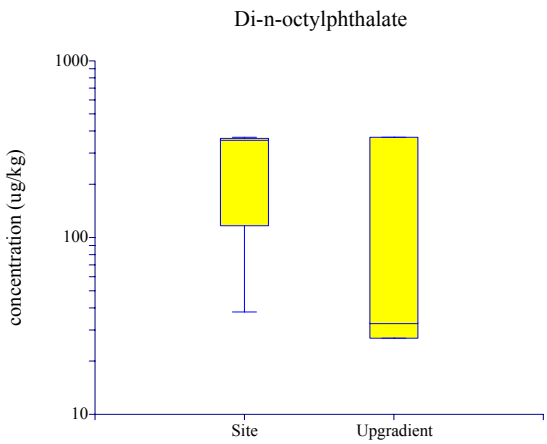
FIGURE 1-1
SITE 12 LAYOUT

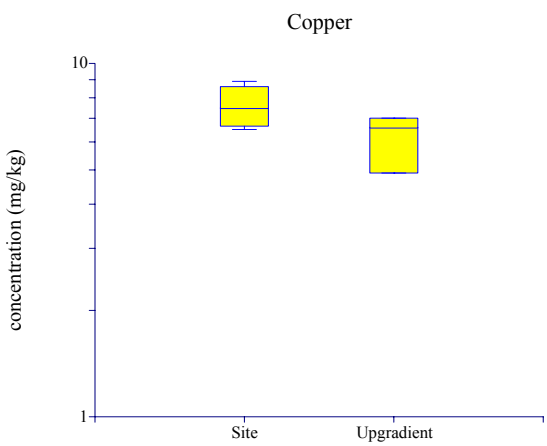
NAVAL WEAPONS STATION YORKTOWN

YORKTOWN, VIRGINIA

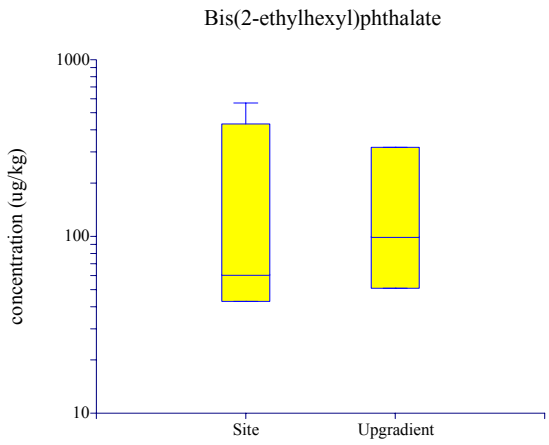
FIGURE 1-2
BOXPLOT COMPARISON OF SITE AND REFERENCE SOILS
SITE 12 – DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

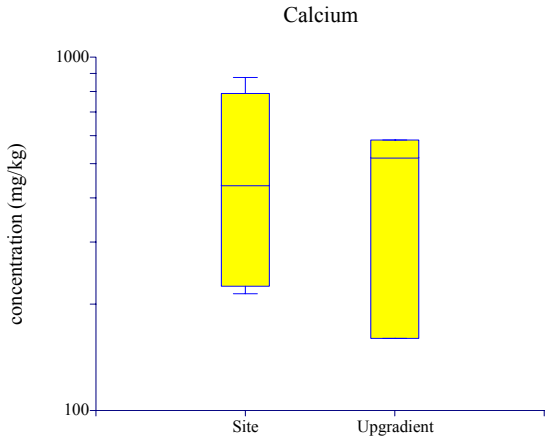
SURFACE SOILS





SUBSURFACE SOILS





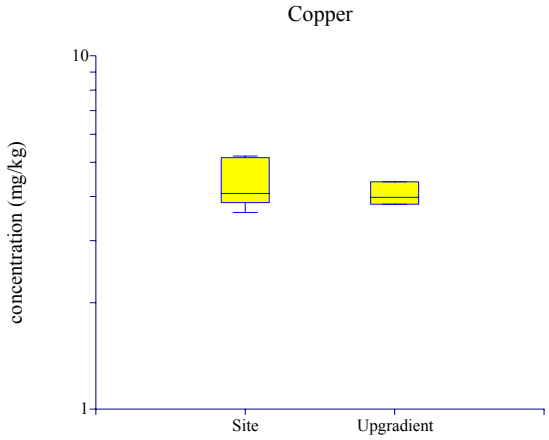
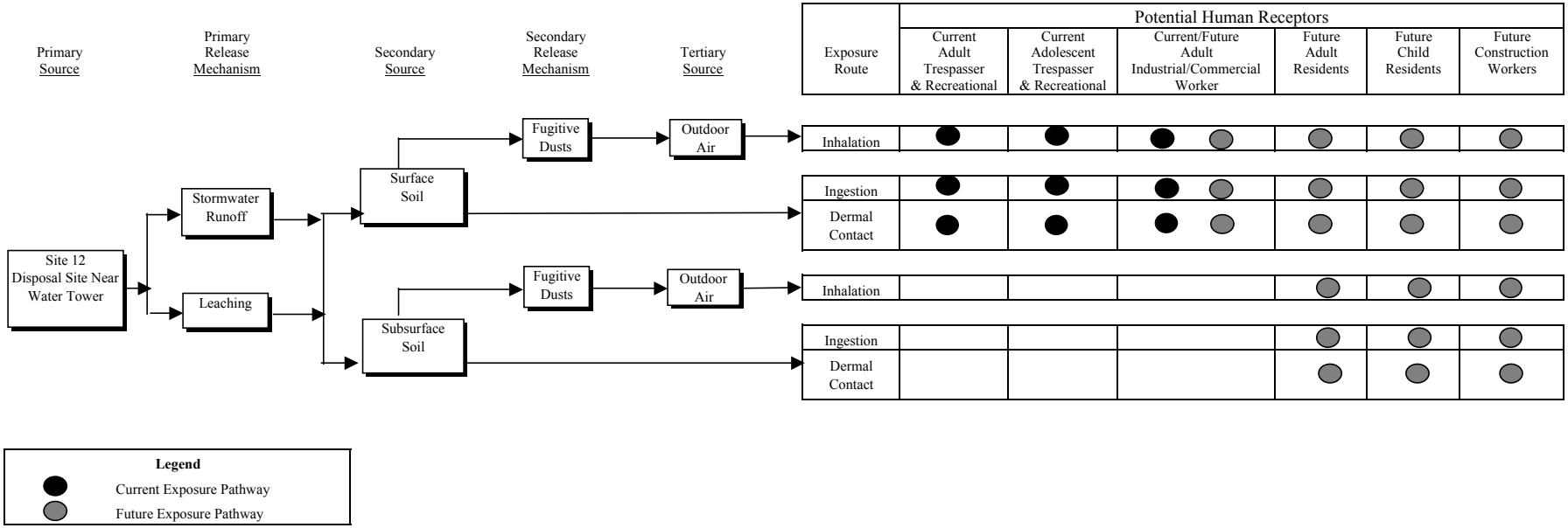


FIGURE 2-1
FLOWCHART OF POTENTIAL EXPOSURE PATHWAYS AND RECEPTORS
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA
CHEATHAM ANNEX SITE



ATTACHMENT A

DATA AND STATISTICAL SUMMARIES

ATTACHMENT A-1
SUMMARY OF SURFACE SOIL SAMPLES
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SS01	12SS02	12SS03	12SS04	12SS05	12SS06	12SS07	12SS08	12SS04
Date	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
Depth Range (inches)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 0
Volatiles (ug/kg)									
1,1,1-Trichloroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1,2-Trichloroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1-Dichloroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,1-Dichloroethene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2,4-Trichlorobenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dibromo-3-Chloropropane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dibromoethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichlorobenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichloroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,2-Dichloropropane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,3-Dichlorobenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
1,4-Dichlorobenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
2-Hexanone	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Acetone	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Benzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Bromodichloromethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Bromoform	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Bromomethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Carbon Disulfide	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Carbon Tetrachloride	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Chlorobenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Chloroethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Chloroform	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Chloromethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Cis-1,2-Dichloroethene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Cis-1,3-Dichloropropene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Cyclohexane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Dibromochloromethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Dichlorodifluoromethane	11 UJ	11 UJ	11 UJ	11 U	11 UJ	11 UJ	11 UJ	11 UJ	11 UJ
Ethylbenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Isopropylbenzene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Methyl Acetate	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Methyl Ethyl Ketone	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Methyl Isobutyl Ketone	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U

ATTACHMENT A-1
SUMMARY OF SURFACE SOIL SAMPLES
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SS01	12SS02	12SS03	12SS04	12SS05	12SS06	12SS07	12SS08	12SS04
Date	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
Depth Range (inches)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 0
Volatiles (ug/kg)									
Methyl Tert-Butyl Ether	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Methylcyclohexane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Methylene Chloride	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Styrene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Tetrachloroethene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Toluene	2 B	3 B	2 B	1 J	2 B	2 B	2 B	2 B	1 B
Trans-1,2-Dichloroethene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Trans-1,3-Dichloropropene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Trichloroethene	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Trichlorofluoromethane	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Vinyl Chloride	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Xylenes	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U	11 U
Semivolatiles (ug/kg)									
2,2'-Oxybis(1-Chloropropane)	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2,4,5-Trichlorophenol	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U
2,4,6-Trichlorophenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2,4-Dichlorophenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2,4-Dimethylphenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2,4-Dinitrophenol	910 UJ	910 UJ	910 UJ	930 UJ	920 UJ	920 UJ	920 UJ	910 UJ	920 UJ
2,4-Dinitrotoluene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2,6-Dinitrotoluene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2-Chloronaphthalene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2-Chlorophenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2-Methylnaphthalene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2-Methylphenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
2-Nitroaniline	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U
2-Nitrophenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
3,3'-Dichlorobenzidine	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
3-Nitroaniline	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U
4,6-Dinitro-2-Methylphenol	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U
4-Bromophenyl Phenyl Ether	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
4-Chloro-3-Methylphenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
4-Chloroaniline	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
4-Chlorophenylphenylether	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
4-Methylphenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
4-Nitroaniline	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U

ATTACHMENT A-1
SUMMARY OF SURFACE SOIL SAMPLES
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SS01	12SS02	12SS03	12SS04	12SS05	12SS06	12SS07	12SS08	12SS04
Date	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
Depth Range (inches)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 0
Semivolatiles (ug/kg)									
4-Nitrophenol	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U
Acenaphthene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Acenaphthylene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	15 J	370 U
Acetophenone	12 B	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Anthracene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	19 J	370 U
Atrazine	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Benzaldehyde	360 U	360 U	360 U	370 U	370 U	370 U	370 U	5 B	370 U
Benzo(a)Anthracene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	140 J	370 U
Benzo(a)Pyrene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	140 J	370 U
Benzo(b)Fluoranthene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	350 J	370 U
Benzo(g,h,i)Perylene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	77 J	370 U
Benzo(k)Fluoranthene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	310 J	370 U
Biphenyl	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Bis(2-Chloroethoxy)Methane	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Bis(2-Chloroethyl)Ether	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Bis(2-Ethylhexyl)Phthalate	130 B	36 B	48 B	76 B	36 B	75 B	28 B	600	44 B
Butylbenzylphthalate	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Caprolactam	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Carbazole	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Chrysene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	250 J	370 U
Di-n-Butylphthalate	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Di-n-Octyl Phthalate	360 U	360 U	360 U	38 J	370 U	370 U	33 J	27 J	370 U
Dibenzo(a,h)Anthracene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	37 J	370 U
Dibenzofuran	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Diethylphthalate	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Dimethylphthalate	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Fluoranthene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	370	370 U
Fluorene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Hexachlorobenzene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Hexachlorobutadiene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Hexachlorocyclopentadiene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Hexachloroethane	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Indeno(1,2,3-cd)Pyrene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	93 J	370 U
Isophorone	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
N-Nitroso-Di-n-Propylamine	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
N-Nitrosodiphenylamine	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U

ATTACHMENT A-1
SUMMARY OF SURFACE SOIL SAMPLES
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SS01	12SS02	12SS03	12SS04	12SS05	12SS06	12SS07	12SS08	12SS04
Date	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
Depth Range (inches)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 0
Semivolatiles (ug/kg)									
Naphthalene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Nitrobenzene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Pentachlorophenol	910 U	910 U	910 U	930 U	920 U	920 U	920 U	910 U	920 U
Phenanthrene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	20 J	370 U
Phenol	360 U	360 U	360 U	370 U	370 U	370 U	370 U	360 U	370 U
Pyrene	360 U	360 U	360 U	370 U	370 U	370 U	370 U	660	370 U
Pesticides (ug/kg)									
4,4'-DDD	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
4,4'-DDE	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
4,4'-DDT	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Aldrin	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Alpha-BHC	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Alpha-Chlordane	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Beta-BHC	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Delta-BHC	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Dieldrin	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Endosulfan I	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Endosulfan II	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Endosulfan Sulfate	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Endrin	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Endrin Aldehyde	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Endrin Ketone	3.6 U	3.6 U	3.6 U	3.7 U	3.7 U	3.7 U	3.7 U	3.6 U	3.7 U
Gamma-BHC (Lindane)	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Gamma-Chlordane	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	6 J	1.9 U
Heptachlor	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Heptachlor Epoxide	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Methoxychlor	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U	19 U
Toxaphene	190 U	190 U	190 U	190 U	190 U	190 U	190 U	190 U	190 U
PCBs (ug/kg)									
Aroclor-1016	36 U	36 U	36 U	37 U	37 U	37 U	37 U	36 U	37 U
Aroclor-1221	74 U	74 U	74 U	75 U	74 U	74 U	74 U	74 U	74 U
Aroclor-1232	36 U	36 U	36 U	37 U	37 U	37 U	37 U	36 U	37 U
Aroclor-1242	36 U	36 U	36 U	37 U	37 U	37 U	37 U	36 U	37 U
Aroclor-1248	36 U	36 U	36 U	37 U	37 U	37 U	37 U	36 U	37 U
Aroclor-1254	36 U	36 U	36 U	37 U	37 U	37 U	37 U	36 U	37 U
Aroclor-1260	36 U	36 U	36 U	37 U	37 U	37 U	37 U	36 U	37 U

ATTACHMENT A-1
SUMMARY OF SURFACE SOIL SAMPLES
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SS01	12SS02	12SS03	12SS04	12SS05	12SS06	12SS07	12SS08	12SS04
Date	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
Depth Range (inches)	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 0
Metals (mg/kg)									
Aluminum	9130	6720	7850	11400	8370	9680	7300	6190	10400
Antimony	0.47 UL	0.48 UL	0.48 UL	0.48 UL	0.46 UL	0.48 UL	0.46 UL	0.44 UL	0.49 UL
Arsenic	1.2 B	0.87 B	0.79 B	1.5 B	0.83 B	0.95 B	0.83 B	0.54 B	1.1 B
Barium	19.1 J	21.3 J	15.4 J	20.2 J	13 J	42.3 J	13.6 J	12 J	19.5 J
Beryllium	0.14 B	0.13 B	0.11 B	0.18 B	0.12 B	0.17 B	0.12 B	0.082 B	0.16 B
Cadmium	0.086 U	0.088 U	0.088 U	0.087 U	0.083 U	0.087 U	0.084 U	0.081 U	0.089 U
Calcium	230 J	319 J	539 J	761 J	564 J	548 J	311 J	366 J	756 J
Chromium	6.7	6.9	6.4	9.9	6.4	7.5	5.6	5.3	8.2
Cobalt	0.89 J	0.99 J	1.4 J	3.1 J	1.3 J	2.1 J	2 J	0.63 J	1.2 J
Copper	8.3	6.5	6.8	8.9	7.5	7	6.6	4.9 J	7.5
Cyanide, Total	0.032 U	0.033 U	0.033 U	0.033 U	0.036 B	0.033 U	0.033 U	0.036 B	0.033 U
Iron	6540	7100	5710	8950	6360	8250	5450	4640	8110
Lead	5.9 K	5.8 K	6.3 K	7.3 K	5.4 K	7.9 K	5.3 K	5.7 K	6.6 K
Magnesium	266 J	297 J	248 J	322 J	273 J	298 J	237 J	219 J	292 J
Manganese	38 J	32 J	39.2 J	80.2 J	65.2 J	30.8 J	33.6 J	8.2 J	35.5 J
Mercury	0.089 B	0.079 B	0.089 B	0.098 B	0.075 B	0.087 B	0.096 B	0.083 B	0.061 B
Nickel	3 J	2.2 J	2.5 J	3.5 J	2.5 J	2.7 J	2.9 J	1.6 J	2.9 J
Potassium	242 J	229 J	229 J	322 J	263 J	339 J	220 J	207 J	301 J
Selenium	0.45 UL	0.46 UL	0.46 UL	0.63 J	0.43 UL	0.46 UL	0.44 UL	0.42 UL	0.47 UL
Silver	0.11 U	0.11 U	0.11 U	0.11 U	0.1 U	0.11 U	0.1 U	0.1 U	0.11 U
Sodium	55.4 J	68.6 J	55.8 J	52.1 J	36.3 J	54.9 J	52.1 J	52.1 J	70 J
Thallium	0.47 UL	0.48 UL	0.48 UL	0.48 UL	0.46 UL	0.48 UL	0.46 UL	0.44 UL	0.49 UL
Vanadium	12.5	13.7	12.5	16.7	12.2	17.9	10.5 J	10.7	15.3
Zinc	9.8	7.4 K	6.4 K	8.1 K	7 K	10.2	6.8 K	5.3 K	7 K

ATTACHMENT A-1
SUMMARY OF SURFACE SOIL SAMPLES
SITE 12 - DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID Date Depth Range (inches)	Frequency of Detection	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
Volatiles (ug/kg)									
Toluene	1/9	1	0.25	1.155	-0.03	0.28	1.2314	No	No
Semivolatiles (ug/kg)									
Acenaphthylene	1/9	164.44	56.09	199.21	4.93	0.83	478.59	No	No
Anthracene	1/9	164.89	54.76	198.83	4.96	0.76	401.30	No	No
Benzo(a)Anthracene	1/9	178.33	14.58	187.37	5.18	0.09	189.18	No	No
Benzo(a)Pyrene	1/9	178.33	14.58	187.37	5.18	0.09	189.18	No	No
Benzo(b)Fluoranthene	1/9	201.67	55.68	236.18	5.28	0.22	234.95	No	No
Benzo(g,h,i)Perylene	1/9	171.33	35.46	193.31	5.11	0.29	212.97	No	No
Benzo(k)Fluoranthene	1/9	197.22	42.36	223.48	5.27	0.18	222.03	No	No
Bis(2-Ethylhexyl)Phthalate	1/9	92.94	190.80	211.21	3.61	1.15	336.98	No	No
Chrysene	1/9	190.56	22.42	204.45	5.24	0.1	204.53	No	No
Di-n-Octyl Phthalate	3/9	132.56	75.00	179.04	4.63	0.87	378.54	No	No
Dibenzo(a,h)Anthracene	1/9	166.89	48.77	197.12	5.03	0.53	279.87	No	No
Fluoranthene	1/9	203.89	62.34	242.53	5.29	0.23	240.50	No	No
Indeno(1,2,3-cd)Pyrene	1/9	173.11	30.14	191.79	5.13	0.23	204.63	No	No
Phenanthrene	1/9	165.00	54.43	198.74	4.96	0.74	391.76	No	No
Pyrene	1/9	236.11	158.98	334.65	5.35	0.43	326.41	No	No
Pesticides (ug/kg)									
Gamma-Chlordane	1/9	1.51	1.68	2.55	0.15	0.61	2.49	No	No
Metals (mg/kg)									
Aluminum	9/9	8560.00	1737.84	9637.20	9.04	0.2	9920.34	Yes	Yes
Barium	9/9	19.60	9.18	25.29	2.9	0.38	26.08	Yes	No
Calcium	9/9	488.22	193.54	608.19	6.12	0.42	694.06	Yes	Yes
Chromium	9/9	6.99	1.40	7.86	1.93	0.19	7.96	Yes	Yes
Cobalt	9/9	1.51	0.77	1.99	0.31	0.49	2.27	Yes	Yes
Copper	9/9	7.11	1.15	7.82	1.95	0.17	8.00	Yes	Yes
Iron	9/9	6790.00	1434.73	7679.32	8.8	0.22	7939.54	Yes	Yes
Lead	9/9	6.24	0.88	6.79	1.82	0.14	6.85	Yes	Yes
Magnesium	9/9	272.44	33.25	293.06	5.6	0.12	296.63	Yes	Yes
Manganese	9/9	40.30	20.84	53.22	3.55	0.64	76.66	Yes	Yes
Nickel	9/9	2.64	0.54	2.98	0.95	0.22	3.11	Yes	Yes
Potassium	9/9	261.33	47.98	291.07	5.55	0.18	295.18	Yes	Yes
Selenium	1/9	0.27	0.14	0.35	-1.38	0.35	0.35	No	No
Sodium	9/9	55.26	9.91	61.40	4	0.19	62.96	Yes	Yes
Vanadium	9/9	13.56	2.58	15.16	2.59	0.19	15.40	Yes	Yes
Zinc	9/9	7.56	1.58	8.53	2	0.2	8.76	Yes	Yes

ATTACHMENT A-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SB01	12SB02	12SB03	12SB04	12SB05	12SB06	12SB06	12SB07	12SB08
Depth Range (inches)	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24
Volatiles (ug/kg)									
1,1,1-Trichloroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,1,2,2-Tetrachloroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,1,2-Trichloroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,1-Dichloroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,1-Dichloroethene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,2,4-Trichlorobenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,2-Dibromo-3-Chloropropane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,2-Dibromoethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,2-Dichlorobenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,2-Dichloroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,2-Dichloropropane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,3-Dichlorobenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
1,4-Dichlorobenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
2-Hexanone	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Acetone	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Benzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Bromodichloromethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Bromoform	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Bromomethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Carbon Disulfide	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Carbon Tetrachloride	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Chlorobenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Chloroethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Chloroform	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Chloromethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Cis-1,2-Dichloroethene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Cis-1,3-Dichloropropene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Cyclohexane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Dibromochloromethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Dichlorodifluoromethane	11 UJ	12 UJ	11 UJ	11 UJ	11 UJ	11 U	11 U	12 U	11 U
Ethylbenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Isopropylbenzene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Methyl Acetate	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Methyl Ethyl Ketone	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Methyl Isobutyl Ketone	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U

ATTACHMENT A-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SB01	12SB02	12SB03	12SB04	12SB05	12SB06	12SB06	12SB07	12SB08
Depth Range (inches)	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24
Volatiles (ug/kg)									
Methyl Tert-Butyl Ether	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Methylcyclohexane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Methylene Chloride	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Styrene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Tetrachloroethene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Toluene	2 B	2 B	2 B	2 B	1 B	1 J	1 J	1 J	1 J
Trans-1,2-Dichloroethene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Trans-1,3-Dichloropropene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Trichloroethene	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Trichlorofluoromethane	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Vinyl Chloride	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Xylenes	11 U	12 U	11 U	11 U	11 U	11 U	11 U	12 U	11 U
Semivolatiles (ug/kg)									
2,2'-Oxybis(1-Chloropropane)	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2,4,5-Trichlorophenol	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
2,4,6-Trichlorophenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2,4-Dichlorophenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2,4-Dimethylphenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2,4-Dinitrophenol	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
2,4-Dinitrotoluene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2,6-Dinitrotoluene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2-Chloronaphthalene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2-Chlorophenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2-Methylnaphthalene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2-Methylphenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
2-Nitroaniline	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
2-Nitrophenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
3,3'-Dichlorobenzidine	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
3-Nitroaniline	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
4,6-Dinitro-2-Methylphenol	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
4-Bromophenyl Phenyl Ether	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
4-Chloro-3-Methylphenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
4-Chloroaniline	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
4-Chlorophenylphenylether	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
4-Methylphenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
4-Nitroaniline	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U

ATTACHMENT A-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SB01	12SB02	12SB03	12SB04	12SB05	12SB06	12SB06	12SB07	12SB08
Depth Range (inches)	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24
Semivolatiles (ug/kg)									
4-Nitrophenol	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
Acenaphthene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Acenaphthylene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Acetophenone	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Anthracene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Atrazine	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Benzaldehyde	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Benzo(a)Anthracene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	41 J
Benzo(a)Pyrene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	46 J
Benzo(b)Fluoranthene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	97 J
Benzo(g,h,i)Perylene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Benzo(k)Fluoranthene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	96 J
Biphenyl	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Bis(2-Chloroethoxy)Methane	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Bis(2-Chloroethyl)Ether	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Bis(2-Ethylhexyl)Phthalate	61 B	43 B	43 B	330 B	570	320 J	120 J	100 B	51 B
Butylbenzylphthalate	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Caprolactam	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Carbazole	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Chrysene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	82 J
Di-n-Butylphthalate	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Di-n-Octyl Phthalate	370 U	390 U	380 U	380 U	15 J	25 J	380 U	380 U	380 U
Dibenzo(a,h)Anthracene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Dibenzofuran	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Diethylphthalate	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Dimethylphthalate	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Fluoranthene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	110 J
Fluorene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Hexachlorobenzene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Hexachlorobutadiene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Hexachlorocyclopentadiene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Hexachloroethane	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Indeno(1,2,3-cd)Pyrene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	33 J
Isophorone	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
N-Nitroso-Di-n-Propylamine	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
N-Nitrosodiphenylamine	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U

ATTACHMENT A-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SB01	12SB02	12SB03	12SB04	12SB05	12SB06	12SB06	12SB07	12SB08
Depth Range (inches)	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24
Semivolatiles (ug/kg)									
Naphthalene	370 U	33 J	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Nitrobenzene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Pentachlorophenol	930 U	980 U	940 U	950 U	940 U	930 U	940 U	970 U	950 U
Phenanthrene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Phenol	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	380 U
Pyrene	370 U	390 U	380 U	380 U	380 U	370 U	380 U	380 U	140 J
Pesticides (ug/kg)									
4,4'-DDD	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
4,4'-DDE	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
4,4'-DDT	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Aldrin	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Alpha-BHC	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Alpha-Chlordane	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Beta-BHC	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Delta-BHC	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Dieldrin	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Endosulfan I	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Endosulfan II	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Endosulfan Sulfate	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Endrin	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Endrin Aldehyde	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Endrin Ketone	3.7 U	3.9 U	3.8 U	3.8 U	3.8 U	3.7 U	3.8 U	3.8 U	3.8 U
Gamma-BHC (Lindane)	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Gamma-Chlordane	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Heptachlor	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Heptachlor Epoxide	1.9 U	2 U	1.9 U	2 U	1.9 U	1.9 U	1.9 U	2 U	2 U
Methoxychlor	19 U	20 U	19 U	20 U	19 U	19 U	19 U	20 U	20 U
Toxaphene	190 U	200 U	190 U	200 U	190 U	190 U	190 U	200 U	200 U
PCBs (ug/kg)									
Aroclor-1016	37 U	39 U	38 U	38 U	38 U	37 U	38 U	38 U	38 U
Aroclor-1221	75 U	79 U	76 U	77 U	76 U	75 U	76 U	78 U	77 U
Aroclor-1232	37 U	39 U	38 U	38 U	38 U	37 U	38 U	38 U	38 U
Aroclor-1242	37 U	39 U	38 U	38 U	38 U	37 U	38 U	38 U	38 U
Aroclor-1248	37 U	39 U	38 U	38 U	38 U	37 U	38 U	38 U	38 U
Aroclor-1254	37 U	39 U	38 U	38 U	38 U	37 U	38 U	38 U	38 U
Aroclor-1260	37 U	39 U	38 U	38 U	38 U	37 U	38 U	38 U	38 U

ATTACHMENT A-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	12SB01	12SB02	12SB03	12SB04	12SB05	12SB06	12SB06	12SB07	12SB08
Depth Range (inches)	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02	20-Jun-02
	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24	6 - 24
Metals (mg/kg)									
Aluminum	7300	5120	4550	6100	4950	3230	3990	6780	4180
Antimony	0.49 UL	0.5 UL	0.49 UL	0.5 UL	0.5 UL	0.48 UL	0.48 UL	0.47 UL	0.5 UL
Arsenic	1.3 B	0.46 U	1.3 B	0.77 B	0.46 U	0.44 U	0.44 U	0.67 B	0.46 U
Barium	11.9 J	6.1 J	6.6 J	9.7 J	5.8 J	9.1 J	14.7 J	7.3 J	5.3 J
Beryllium	0.14 B	0.046 U	0.044 U	0.053 B	0.046 U	0.044 U	0.044 U	0.047 B	0.046 U
Cadmium	0.089 U	0.091 U	0.089 U	0.091 U	0.091 U	0.088 U	0.088 U	0.086 U	0.091 U
Calcium	236 J	214 J	711 J	435 J	876 J	416 J	521 J	583 J	160 J
Chromium	7.5	5.5	8	7.3	6.4	4	4	9.9	5.6
Cobalt	0.36 J	0.16 J	0.15 U	0.34 J	0.16 U	0.15 U	0.2 J	0.15 U	0.16 U
Copper	5.2 J	4.1 J	3.6 J	5.1 J	4.1 J	3.9 J	4 J	3.8 J	4.4 J
Cyanide, Total	0.032 U	0.094 B	0.033 U	0.034 U	0.04 B	0.033 U	0.033 U	0.033 U	0.033 U
Iron	9100 J	3740 J	8360 J	7060 J	4360 J	2820 J	2830 J	6940 J	3670 J
Lead	4.8	4.8	4.1	5	4.6	4.2	4.4	5.5	5
Magnesium	243 J	217 J	161 B	235 J	193 B	130 B	154 B	281 J	143 B
Manganese	10 J	3 J	3 J	11.2 J	2.8 J	3 J	3 J	3.6 J	2.4 J
Mercury	0.082 B	0.11 B	0.079 B	0.086 B	0.077 B	0.084 B	0.094 B	0.098 B	0.093 B
Nickel	1.8 J	0.51 J	0.49 J	1.1 J	0.56 J	0.4 J	0.4 J	0.67 J	0.36 J
Potassium	271 J	189 B	213 B	240 J	215 B	150 B	201 B	228 J	146 B
Selenium	0.52 B	0.48 U	0.63 B	0.51 B	0.48 U	0.46 U	0.93 B	0.71 B	0.48 U
Silver	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
Sodium	46.7 J	65.2 J	44.7 J	46.2 J	53.4 J	59.9 J	46.3 J	67.5 J	37.9 J
Thallium	0.49 U	0.5 U	0.49 U	0.5 U	0.5 U	0.48 U	0.48 U	0.47 U	0.5 U
Vanadium	17.2	17.1	20.8	17.4	15	13.2	12.1	33.5	17.6
Zinc	4.7 K	10.6	3.4 J	3.8 J	1.9 B	2.2 J	2.9 J	13.9	2.6 J

ATTACHMENT A-2
SUMMARY OF SUBSURFACE SOIL SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID Depth Range (inches)	Frequency of Detection	Arithmatic Mean Half Non-Detects	Standard Deviation	Upper 95% Confidence Level	Log Arithmatic Mean Half Non-Detects	Log Standard Deviation	Log Upper 95% Confidence Level	Lognormally Distributed	Normally Distributed
Volatiles (ug/kg)									
Toluene	4/9	0.9444	0.1667	1.0477	-0.08	0.23	1.1207	No	No
Semivolatiles (ug/kg)									
Benzo(a)Anthracene	1/9	172.89	49.55	203.60	5.07	0.51	282.55	No	No
Benzo(a)Pyrene	1/9	173.44	47.89	203.13	5.09	0.47	264.45	No	No
Benzo(b)Fluoranthene	1/9	179.11	30.94	198.29	5.17	0.22	211.28	No	No
Benzo(k)Fluoranthene	1/9	179.00	31.27	198.38	5.17	0.23	211.72	No	No
Bis(2-Ethylhexyl)Phthalate	3/9	147.11	186.80	262.90	4.3	1.24	851.62	Yes	No
Chrysene	1/9	177.44	35.92	199.71	5.15	0.28	218.83	No	No
Di-n-Octyl Phthalate	2/9	152.22	75.05	198.74	4.74	1.02	754.22	No	No
Fluoranthene	1/9	180.56	26.63	197.06	5.18	0.18	204.87	No	No
Indeno(1,2,3-cd)Pyrene	1/9	172.00	52.21	204.36	5.05	0.58	305.39	No	No
Naphthalene	1/9	171.44	51.96	203.65	5.05	0.58	303.98	No	No
Pyrene	1/9	183.89	16.73	194.26	5.21	0.1	197.16	No	No
Metals (mg/kg)									
Aluminum	9/9	5133.33	1348.76	5969.36	8.51	0.26	6220.11	Yes	Yes
Barium	9/9	8.50	3.17	10.46	2.08	0.35	11.11	Yes	Yes
Calcium	9/9	461.33	239.31	609.67	6	0.58	783.01	Yes	Yes
Chromium	9/9	6.47	1.93	7.66	1.83	0.31	8.21	Yes	Yes
Cobalt	4/9	0.16	0.12	0.23	-2.04	0.67	0.30	No	No
Copper	9/9	4.24	0.56	4.59	1.44	0.13	4.63	Yes	Yes
Iron	9/9	5431.11	2440.84	6944.06	8.51	0.46	7974.72	Yes	Yes
Lead	9/9	4.71	0.44	4.98	1.55	0.09	5.00	Yes	Yes
Magnesium	4/9	151.83	89.37	207.23	4.86	0.62	274.81	No	No
Manganese	9/9	4.67	3.39	6.77	1.37	0.57	7.58	No	No
Nickel	9/9	0.70	0.47	0.99	-0.5	0.53	1.10	Yes	No
Potassium	3/9	144.00	78.49	192.65	4.85	0.51	226.20	Yes	No
Sodium	9/9	51.98	10.16	58.27	3.93	0.19	59.34	Yes	Yes
Vanadium	9/9	18.21	6.29	22.11	2.86	0.29	22.46	Yes	No
Zinc	8/9	5.01	4.32	7.68	1.32	0.81	12.27	Yes	No

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11RB01	11RB02	11RB03	11RB04	11RB05	11RB06	11FBDI	11FBDS	11FBRIG
Date	11-Jun-02	12-Jun-02	12-Jun-02	13-Jun-02	18-Jun-02	21-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
Volatiles (ug/l)									
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-Chloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane-D4	47	47	47	53	55	44	52	48	51
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 UJ	5 B	10 UJ	10 U	10 UJ
4-Bromofluorobenzene	49	49	49	52	53	46	49	49	49
Acetone	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U	10 UJ
Benzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	4 J
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	18
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane	10 UJ	10 UJ	10 UJ	10 U	10 U	10 UJ	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11RB01	11RB02	11RB03	11RB04	11RB05	11RB06	11FBDI	11FBDS	11FBRIG
Date	11-Jun-02	12-Jun-02	12-Jun-02	13-Jun-02	18-Jun-02	21-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
Volatiles (ug/l)									
Methyl Ethyl Ketone	10 U	10 U	10 U	10 U	10 UJ	10 U	10 UJ	10 U	10 UJ
Methyl Isobutyl Ketone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl Tert-Butyl Ether	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	0.4 B	0.4 B	0.4 B	10 U	0.5 J	10 U	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.6 J
Toluene-D8	51	51	51	54	54	49	49	50	48
Trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	0.4 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichlorofluoromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylenes	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semivolatiles (ug/l)									
1,2-Dichlorobenzene-D4	31	29	39	33	25	29	28	27	25
2,2'-Oxybis(1-Chloropropane)	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
2,4,6-Tribromophenol	74	68	65	60	59	56	60	62	55
2,4,6-Trichlorophenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2,4-Dinitrophenol	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
2,4-Dinitrotoluene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2-Chlorophenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2-Chlorophenol-D4	50	51	69	59	52	51	53	59	46
2-Fluorobiphenyl	36	36	46	38	33	35	37	37	31
2-Fluorophenol	47	47	66	55	48	48	51	54	45
2-Methylnaphthalene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2-Methylphenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
2-Nitroaniline	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
2-Nitrophenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11RB01	11RB02	11RB03	11RB04	11RB05	11RB06	11FBDI	11FBDS	11FBRIG
Date	11-Jun-02	12-Jun-02	12-Jun-02	13-Jun-02	18-Jun-02	21-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
Semivolatiles (ug/l)									
3-Nitroaniline	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
4,6-Dinitro-2-Methylphenol	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
4-Bromophenyl Phenyl Ether	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
4-Chloro-3-Methylphenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
4-Chloroaniline	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
4-Chlorophenylphenylether	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
4-Methylphenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
4-Nitroaniline	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
4-Nitrophenol	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
Acenaphthene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Acenaphthylene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Acetophenone	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Anthracene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Atrazine	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Benzaldehyde	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Benzo(a)Anthracene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Benzo(a)Pyrene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Benzo(b)Fluoranthene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Benzo(g,h,i)Perylene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Benzo(k)Fluoranthene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Biphenyl	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Bis(2-Chloroethoxy)Methane	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Bis(2-Chloroethyl)Ether	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Bis(2-Ethylhexyl)Phthalate	10 U	10 U	11 U	10 U	2 J	2 B	11 U	1 J	5 J
Butylbenzylphthalate	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Caprolactam	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Carbazole	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Chrysene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Dibenzo(a,h)Anthracene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Dibenzofuran	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Diethylphthalate	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Dimethylphthalate	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Di-n-Butylphthalate	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Di-n-Octyl Phthalate	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Fluoranthene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Fluorene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11RB01	11RB02	11RB03	11RB04	11RB05	11RB06	11FBDI	11FBDS	11FBRIG
Date	11-Jun-02	12-Jun-02	12-Jun-02	13-Jun-02	18-Jun-02	21-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
Semivolatiles (ug/l)									
Hexachlorobenzene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	11 U	10 U	10 U	10 UJ	11 U	10 U	10 U
Hexachloroethane	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Indeno(1,2,3-cd)Pyrene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Isophorone	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Naphthalene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Nitrobenzene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Nitrobenzene-D5	38	38	49	41	35	37	37	39	32
N-Nitroso-Di-n-Propylamine	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
N-Nitrosodiphenylamine	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Pentachlorophenol	25 U	26 U	28 U	25 U	25 U	25 U	26 U	25 U	25 U
Phenanthrene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Phenol	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Phenol-D5	50	52	69	59	53	50	52	59	46
Pyrene	10 U	10 U	11 U	10 U	10 U	10 U	11 U	10 U	10 U
Terphenyl-D14	41	42	47	44	46	52	48	43	37
Pesticides (ug/l)									
4,4'-DDD	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDE	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
4,4'-DDT	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Aldrin	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Alpha-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Alpha-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Beta-BHC	0.05 U	0.05 U	0.029 J	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Decachlorobiphenyl	0.13 P	0.16	0.17	0.17	0.15	0.14	0.18	0.14	0.12
Delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Endosulfan I	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Endosulfan II	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Endosulfan Sulfate	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Endrin	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Endrin Aldehyde	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Endrin Ketone	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Gamma-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11RB01	11RB02	11RB03	11RB04	11RB05	11RB06	11FBDI	11FBDS	11FBRIG
Date	11-Jun-02	12-Jun-02	12-Jun-02	13-Jun-02	18-Jun-02	21-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
Pesticides (ug/l)									
Heptachlor	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor Epoxide	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Methoxychlor	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloro-M-Xylene	0.15 P	0.16 P	0.17 P	0.16	0.15	0.14	0.16	0.13	0.12
Toxaphene	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
PCBs (ug/l)									
Aroclor-1016	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Aroclor-1221	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Aroclor-1232	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Aroclor-1242	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Aroclor-1248	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Aroclor-1254	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Aroclor-1260	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Metals (ug/l)									
Aluminum	14.6 B	13.9 U	13.9 U	18.2 B	13.9 U	13.9 U	13.9 U	13.9 U	25.9 B
Antimony	4.2 J	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
Arsenic	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U	4.2 U
Barium	10.9 J	1.2 B	0.1 U	0.1 U	0.13 B	0.1 U	0.14 B	0.1 U	0.33 B
Beryllium	0.28 B	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Cadmium	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Calcium	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	273 B
Chromium	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cobalt	2.7 B	0.63 B	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Copper	2.2 B	1.2 B	1.5 B	0.7 U	2.9 B	0.7 U	1.6 B	1.1 B	1.3 B
Cyanide, Total	3.5 B	1.4 B	2.3 B	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
Iron	11.4 U	11.4 U	11.4 U	11.4 U	11.4 U	11.4 U	11.4 U	11.4 U	18.7 B
Lead	1.3 UL	1.3 UL	1.3 UL	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Magnesium	29.3 B	12.1 U	12.1 U	12.1 U	12.1 U	12.1 U	12.1 U	12.1 U	39.1 B
Manganese	1.1 B	0.22 B	0.24 B	0.17 B	0.13 B	0.11 B	0.1 U	0.12 B	1.2 B
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.14 B	0.1 U	0.1 U	0.1 U
Nickel	1.9 B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Potassium	13.4 U	19.5 B	13.4 U	15.2 B	13.4 U	13.4 U	13.4 U	13.4 U	21.1 J
Selenium	2.2 U	2.2 U	2.2 U	2.2 UL	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Silver	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Sodium	244 B	699 B	511 B	718 B	486 B	619 B	481 B	146 U	506 B
Thallium	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 UL	3.3 U	3.3 U	3.3 U

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11RB01	11RB02	11RB03	11RB04	11RB05	11RB06	11FBDI	11FBDS	11FBRIG
Date	11-Jun-02	12-Jun-02	12-Jun-02	13-Jun-02	18-Jun-02	21-Jun-02	18-Jun-02	18-Jun-02	18-Jun-02
Metals (ug/l)									
Vanadium	2.9 B	0.84 B	0.5 U	0.5 U	0.5 U	0.5 U	0.56 B	0.5 U	0.5 U
Zinc	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL	1.4 UL
Dissolved Metals (ug/l)									
Aluminum						13.9 U	29 B	34.6 B	249 B
Antimony						1.6 U	1.6 U	2.2 J	1.6 U
Arsenic						4.2 U	4.2 U	4.2 U	4.2 U
Barium						0.34 B	0.15 B	5.3 J	20.7 J
Beryllium						0.2 U	0.31 B	0.39 B	0.23 B
Cadmium						0.3 U	0.3 U	0.3 U	0.3 U
Calcium						20.6 B	1.7 U	1.7 U	25900
Chromium						0.5 U	0.5 U	0.5 U	1.6 B
Cobalt						0.6 U	0.6 U	1 J	0.6 U
Copper						2.1 B	0.8 B	0.7 U	9.2 J
Iron						12.5 B			
Lead						1.3 U	11.4 U	11.4 U	11.4 U
Magnesium						20.2 B	1.3 U	1.3 U	1.3 U
Manganese						0.29 B	12.1 U	15.5 B	2840 J
Mercury						0.14 B	0.29 B	0.53 B	1.2 B
Nickel						0.5 U	0.1 U	0.1 U	0.1 U
Potassium						13.9 B	0.5 U	1 B	0.5 U
Selenium						2.2 U	18.5 B	13.4 U	2210 J
Silver						0.7 U	2.2 UL	2.2 UL	2.2 UL
Sodium						573 B	0.7 U	0.82 J	0.7 U
Thallium						3.3 UL	378 B	179 B	18500
Vanadium						0.5 U	3.3 U	3.3 U	3.3 U
Zinc						1.4 UL	0.5 U	1.4 B	2.6 B
							1.4 UL	1.4 UL	1.4 UL

ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11TB01	11TB02	11TB03	11TB04
Date	12-Jun-02	14-Jun-02	18-Jun-02	21-Jun-02
Volatiles (ug/l)				
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U
1,2-Dibromo-3-Chloropropane	10 U	10 U	10 U	10 U
1,2-Dibromoethane	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U
1,2-Dichloroethane-D4	47	51	54	46
1,2-Dichloropropane	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 UJ	3 B
4-Bromofluorobenzene	49	49	52	49
Acetone	10 U	10 U	10 UJ	10 U
Benzene	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U
Carbon Disulfide	10 U	10 U	10 U	10 U
Carbon Tetrachloride	10 U	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U
Cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U
Cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U
Dichlorodifluoromethane	10 UJ	10 U	10 U	10 UJ
Ethylbenzene	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U
Methyl Acetate	10 U	10 U	10 U	10 U

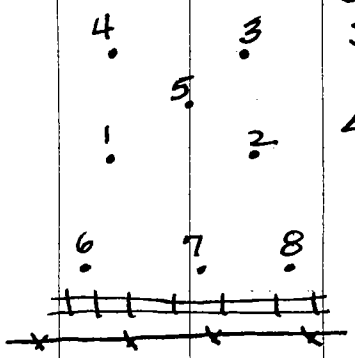
ATTACHMENT A-3
SUMMARY OF FIELD QA/QC SAMPLES
SITE 12 DISPOSAL SITE NEAR WATER TOWER
NO FURTHER RESPONSE ACTION PLANNED
NAVAL WEAPONS STATION YORKTOWN, CHEATHAM ANNEX SITE
WILLIAMSBURG, VIRGINIA

Site ID	11TB01	11TB02	11TB03	11TB04
Date	12-Jun-02	14-Jun-02	18-Jun-02	21-Jun-02
Volatiles (ug/l)				
Methyl Ethyl Ketone	10 U	10 U	10 UJ	10 U
Methyl Isobutyl Ketone	10 U	10 U	10 U	10 U
Methyl Tert-Butyl Ether	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U
Methylene Chloride	0.3 B	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U
Toluene	10 U	10 U	10 U	10 U
Toluene-D8	52	45	54	51
Trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U
Trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U
Trichlorofluoromethane	10 U	10 U	10 U	10 U
Vinyl Chloride	10 U	10 U	10 U	10 U
Xylenes	10 U	10 U	10 U	10 U

ATTACHMENT B

FIELD INVESTIGATION LOGBOOK AND COCS

SITE 12
SOIL BORINGS



NOTE: ALL BORINGS BACKFILLED W/ BENTONITE PLUG

INTENTIONALLY BLANK

MLD

12 SS/SB06

TIME	INTERVAL	DEPTH	BLOWS	PID (ppm)	DESCRIPTION
0845	~~0-2'~~ 01 MLI	0-2'	3.3.4.3	0.0	RECOVERY = 1.0' LT ORANGE FINE SAND W/ SOME SILT, DRY
*0850	~~2-4'~~ 02 MLI	2-4'	3.4.3.2	0.0	RECOVERY = 1.8' LT GRAY SILT W/ LITTLE FINE SAND AND CLAY, DAMP
~~0858~~			~~3.3.6.3~~	MLI	

*SUBSURFACE DUP COLLECTED HERE

12SS/SB07

0858	01	0-2'	3.3.6.3	0.0 ~~REC~~	RECOVERY = 1.0' (SAME AS SS06)
0903	02	2-4'	3.2.3.4	0.0	RECOVERY = 1.8' (SAME AS SB06)

12SS/SB08

TIME	INTERVAL	DEPTH	BLOWS	DESCRIPTION
0912	01	0-2'	4.4.2.3	RECOVERY = 1.0' PID = 0.0 (SAME AS SS06)
0916	02	2-4'	4.5.5.6	RECOVERY = 1.8' PID = 0.0 (SAME AS SB06)

12SS/SB01

TIME	INTERVAL	DEPTH	BLOWS	DESCRIPTION
0925	01	0-2'	4.6.6.5	RECOVERY = 1.5' PID = 0.0 (SAME AS SS06)
0928	02	2-4'	5.6.6.8	RECOVERY = 1.8' PID = 0.0 ORANGE SILTY SOME FINE SAND DRY

12SS/SB04

TIME	INTERVAL	DEPTH	BLOWS	PID	DESCRIPTION
*0938	01	0-2'	9.7.7.6	0.0	RECOVERY = 1.8' ~~PID = 0.0~~ ML (SAME AS SS06) * SURFACE DUP COLLECTED HERE
**0948	02	2-4'	4.4.6.4	0.0	(SAME AS SB06) ** SUBSURFACE MS/MSD COLLECTED HERE

12SS/SB05

TIME	INTERVAL	DEPTH	BLOWS	PID	DESCRIPTION
1002	01	0-2'	5.7.5.6	0.0	RECOVERY = 1.2' (SAME AS SS06)
1010	02	2-4'	4.5.5.6	0.0	RECOVERY = 1.8' (SAME AS SB06)

20JUN02

12SS/SB02

TIME	INTERVAL	DEPTH	BCDWS	DESCRIPTION
1016	01	0-2'	5.7.8.7	RECOVERY=1.4' PID=0.0ppm (SAME AS SS06)
1020	02	2-4'	8.8.8.8	RECOVERY=1.9' PID=0.0ppm (SAME AS 12SB06)

12SS/SB08

*1042	01	0-2'	4.7.6.7	RECOVERY=1.8' PID=0.0ppm (SAME AS SS06) *SURFACE MS/MSD COLLECTED HERE.
1047	02	2-4'	4.4.4.4	RECOVERY=1.6' PID=0.0ppm (SAME AS 12SB06)

WARM, SUNNY, HUMID 21 JUN02

0730 ARR ON-SITE
↳ PACK UP
↳ GO GET ICE
0800 RELOCATE TO SITE 11 TO CONTINUE GW SAMPLING, SOLO
1010 FINISHED W/ 11GW05. RELOCATE TO 11GW08
1130 FINISHED W/ 11GW08. RELOCATE TO 11GW06
1230 FINISHED W/ 11GW06. PACK UP.
1300 RETURN TO BLDG 116.
1325 COLLECT RINSATE 11RB06 FM TUBING
1350 ~~UNPACK~~ UNLOAD EQUIP AND SAMPLES
1405 BEGIN PACKING SAMPLES
1530 MWR OUT OF OFFICE, ∴ NEED TO RELOCATE TO A 7-11. PACK UP.
1615 ARR 7-11 ON JEFFERSON AVE (BY WPNSTA YORKTOWN) FOR ICE AND TO FINISH SAMPLE PACKING.
1730 DPT 7-11
1800 ARR FEDEX
1830 DPT FEDEX

MEP

COMPUCHEM
a division of Liberty Analytical Corp.
501 Madison Avenue
Cary, NC 27513
1-800-833-5097

CHAIN-OF-CUSTODY RECORD

No. 061771 (1)

Project Name : CTO238 CAX SITE 12	Client Address : BAKER ENVIRO 770 LYNNHAVEN PKWY STE 240 VA BEACH VA 23452	Point-of-Contact : MARLENE IVESTER
Carrier : FEDEX		Telephone No. : (757) 631-5462
Airbill No. : 833132728298		Sampling complete? Y or N (see Note 1)
Sampler Name : M. NESTER	Sampler Signature: [signature]	Project-specific (PS) or Batch (B) QC ? ____

BOX #1	BOX #2	BOX #3	Box #4	Box #5
1. Surface Water	A. HCl + Ice	F. Filtered	H. High	C. CLP 3/90
2. Ground Water	B. HNO3 + Ice	U. Unfiltered	M. Medium	T. TCLP
3. Leachate	C. NaOH + Ice		L. Low	S. SW-846
4. Rinsate	D. H2SO4 + Ice			W. CWA 600-series
5. Soil / Sediment / Sludge	E. Unpreserved			O. Other____
6. Trip Blank	F. Ice Only			
7. Oil	G. Other____			
8. Waste	H. NaHSO4 + Ice			
9. Other____	I. ZnAc+NaOH + Ice			

Sample ID (9 characters maximum)	Date: Year: 2002	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered / Unfiltered	Box #4 Expected Conc.	Box #5 Method	No. of Bottles	Use for Lab QC (MS or DUP)	VOA	SVOC	Pesticide	PCB	Herbicide	Metals / Mercury	Cyanide	TOC / TOX	O&G / TPH					Remarks / Comments (see Notes 2 & 3)
12SS01-00	06/20	0925	S	F				3		X	X	X	X		X	X							
12SS02-00	06/20	1016						3		X	X	X	X		X	X							
12SS03-00	06/20	1042						3		X	X	X	X		X	X							
12SS04-00	06/20	0938						3		X	X	X	X		X	X							
12SS05-00	06/20	1002						3		X	X	X	X		X	X							
12SS06-00	06/20	0845						3		X	X	X	X		X	X							
12SS07-00	06/20	0858						3		X	X	X	X		X	X							
12SS08-00	06/20	0912						3		X	X	X	X		X	X							
12SS04-00D	06/20	0938						3	X	X	X	X	X		X	X							DUP
12SS03-00	06/20	1042						6	X	X	X	X	X		X	X							MS AND MSD

Clients Special Instructions: Temperature ____ °C

Lab: Received in Good Condition? Y or N Describe Problems, If any:

#1 Relinquished By: (Sig) [signature] Date: 6/21/02	#2 Relinquished By: (Sig) Date:	#3 Relinquished By: (Sig) Date:
Company Name: BAKER ENVIRO. Time: 1800	Company Name: Time:	Company Name: Time:
#1 Received By: (Sig) Date:	#2 Received By: (Sig) Date:	#3 Received By: (Sig) Date:
Company Name: Time:	Company Name: Time:	Company Name: Time:

Note (1): If "N" lab will hold samples to await remainder of project-maximizing batch size and minimizing QC ratio; if "Y" lab will begin processing batches now.
Note (2): Samples stored 60 days after date report mailed at no extra charge. Note (3): All lab copies of data destroyed after three years.

CompuChem
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501 Madison Avenue
Cary, NC 27513
1-800-833-5097

CHAIN-OF-CUSTODY RECORD

No. 061772 (2)

Project Name : GTO238 CAX SITE 12	Client Address : BAKER ENVIRO. 1770 LYNNHAVEN PKWY 1 STE 240 VA BEACH, VA 23452	Point-of-Contact : MARLENE FUESTER
Carrier : FEDEX		Telephone No. : (757) 631-5462
Airbill No. : 833132728298		Sampling complete? Y or N (see Note 1)
Sampler Name : M. FUESTER	Sampler Signature : [signature]	Project-specific (PS) or Batch (B) QC ? ____

BOX #1	BOX #2	BOX #3	Box #4	Box #5
1. Surface Water	A. HCl + Ice	F. Filtered	H. High	C. CLP 3/90
2. Ground Water	B. HNO3 + Ice	U. Unfiltered	M. Medium	T. TCLP
3. Leachate	C. NaOH + Ice		L. Low	S. SW-846
4. Rinsate	D. H2SO4 + Ice			W. CWA 600-series
5. Soil / Sediment / Sludge	E. Unpreserved			O. Other____
6. Trip Blank	F. Ice Only			
7. Oil	G. Other____			
8. Waste	H. NaHSO4 + Ice			
9. Other____	I. ZnAc+NaOH + Ice			

Sample ID (9 characters maximum)	Date:Year: 2002	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered / Unfiltered	Box #4 Expected Conc.	Box #5 Method	No. of Bottles	Use for Lab QC (MS or DUP)	VOA	SVOC	Pesticide	PCB	Herbicide	Metals / Mercury	Cyanide	TOC / TOX	O&G / TPH					Remarks / Comments (see Notes 2 & 3)
12SB01-01	06/20	0928	5	F				3		Y	Y	Y	Y		Y	Y							
12SB02-01	06/20	1020	↓	↓				3		Y	Y	Y	Y		Y	Y							
12SB03-01	06/20	1017						3		Y	Y	Y	Y		Y	Y							
12SB04-01	06/20	0948						3		Y	Y	Y	Y		Y	Y							
12SB05-01	06/20	1010						3		Y	Y	Y	Y		Y	Y							
12SB06-01	06/20	0850						3		Y	Y	Y	Y		Y	Y							
12SB07-01	06/20	0903						3		Y	Y	Y	Y		Y	Y							
12SB08-01	06/20	0916						3		Y	Y	Y	Y		Y	Y							
12SB06-01D	06/20	0850						3	X	Y	Y	Y	Y		Y	Y							DUP
12SB04-01	06/20	0948	↓	↓				6	X	Y	Y	Y	Y		Y	Y							MS AND MSD

Clients Special Instructions: Temperature ____ °C

Lab: Received in Good Condition? Y or N Describe Problems, If any:

#1 Relinquished By: (Sig) [signature] Date: 6/21/02	#2 Relinquished By: (Sig) Date:	#3 Relinquished By: (Sig) Date:
Company Name: BAKER ENVIRO Time: 1800	Company Name: Time:	Company Name: Time:
#1 Received By: (Sig) Date:	#2 Received By: (Sig) Date:	#3 Received By: (Sig) Date:
Company Name: Time:	Company Name: Time:	Company Name: Time:

Note (1): If "N" lab will hold samples to await remainder of project-maximizing batch size and minimizing QC ratio; if "Y" lab will begin processing batches now.
Note (2): Samples stored 60 days after date report mailed at no extra charge. Note (3): All lab copies of data destroyed after three years.

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Cary, NC 27513
1-800-833-5097

CHAIN-OF-CUSTODY RECORD

No. 061774 (3)

Project Name: CTO238 CAX SITE 12
Carrier: FED EX
Airbill No.: 833132728298
Sampler Name: M. IVESTER

Client Address: BAKER ENVIRO
770 LYNNHAVEN PKWY 1 STE 240
VA BEACH, VA 23452
Sampler Signature: [signature]

Point-of-Contact: MARLENE IVESTER
Telephone No. (757) 631-5462
Sampling complete? Y or N (see Note 1)
Project-specific (PS) or Batch (B) QC ? ____

BOX #1
1. Surface Water
2. Ground Water
3. Leachate
4. Rinsate
5. Soil / Sediment / Sludge
6. Trip Blank
7. Oil
8. Waste
9. Other____

BOX #2
A. HCl + Ice
B. HNO3 + Ice
C. NaOH + Ice
D. H2SO4 + Ice
E. Unpreserved
F. Ice Only
G. Other____
H. NaHSO4 + Ice
I. ZnAc+NaOH + Ice

BOX #3
F. Filtered
U. Unfiltered

Box #4
H. High
M. Medium
L. Low

Box #5
C. CLP 3/90
S. SW-846
W. CWA 600-series
O. Other____
T. TCLP

Sample ID (9 characters maximum)	Date: Year: 2002	Time	Box #1 Matrix	Box #2 Preservative	Box #3 Filtered / Unfiltered	Box #4 Expected Conc.	Box #5 Method	No. of Bottles	Use for Lab QC (MS or DUP)	VOA	SVOC	Pesticide	PCB	Herbicide	Metals / Mercury	Cyanide	TOC / TOX	O&G / TPH					Remarks / Comments (see Notes 2 & 3)
12RB01	06/21	1300	4	A,B,C				9		X	X	X	X		X	X							(PIE PAN)
12TB01	06/21	—	6	A				3		X													
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					
	/	:																					

MED

Clients Special Instructions:

Temperature ____ °C

Lab: Received in Good Condition? Y or N Describe Problems, If any:

#1 Relinquished By: (Sig) [signature]	Date 6/21/02	#2 Relinquished By: (Sig)	Date:	#3 Relinquished By: (Sig)	Date:
Company Name: BAKER ENVIRO	Time: 1800	Company Name:	Time:	Company Name:	Time:
#1 Received By: (Sig)	Date:	#2 Received By: (Sig)	Date:	#3 Received By: (Sig)	Date:
Company Name:	Time:	Company Name:	Time:	Company Name:	Time:

Note (1): If "N" lab will hold samples to await remainder of project-maximizing batch size and minimizing QC ratio; if "Y" lab will begin processing batches now.
Note (2): Samples stored 60 days after date report mailed at no extra charge. Note (3): All lab copies of data destroyed after three years.

ATTACHMENT C
RAGS PART D TABLES

TABLE 1
SELECTION OF EXPOSURE PATHWAYS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Surface Soil	Surface Soil	Surface Soil	On-Site Workers	Adult	Ingestion Dermal	On-site	Quant	Landscaping, work-related activities for site.
				Trespassers	Adult and Adolescent	Ingestion Dermal	On-site	Quant	Accesses site without permission
		Air	Fugitive Dusts	On-Site Workers	Adult	Ingestion Dermal	On-site	Quant	Landscaping, work-related activities for site.
				Trespassers	Adult and Adolescent	Ingestion Dermal	On-site	Quant	Accesses site without permission
Future	Surface Soil	Surface Soil	Surface Soil	Industrial / Commercial Workers	Adult	Ingestion Dermal	On-site	Quant	Walking around the site.
				Construction Workers	Adult	Ingestion Dermal	On-site	Quant	Excavation, construction activities for potential future development.
				Residents	Adult and Young Child	Ingestion Dermal	On-site	Quant	Potential future residential development.
		Air	Fugitive Dusts	Industrial / Commercial Workers	Adult	Ingestion Dermal	On-site	Quant	Walking around the site.
				Construction Workers	Adult	Ingestion Dermal	On-site	Quant	Excavation, construction activities for potential future development.
				Residents	Adult and Young Child	Ingestion Dermal	On-site	Quant	Potential future residential development.
	Subsurface Soil	Subsurface Soil	Subsurface Soil	Construction Workers	Adult	Ingestion Dermal	On-site	Quant	Excavation, construction activities for potential future development.
				Residents	Adult and Young Child	Ingestion Dermal	On-site	Quant	Potential future residential development.
		Air	Fugitive Dusts	Construction Workers	Adult	Ingestion Dermal	On-site	Quant	Excavation, construction activities for potential future development.
				Residents	Adult and Young Child	Ingestion Dermal	On-site	Quant	Potential future residential development.

TABLE 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

CAS Number	Chemical	Minimum Concentration	Minimum Qualifier	Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (1)	Screening (2) Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (3) Contaminant Deletion or Selection
	Volatiles (ug/kg)															
108-88-3	Toluene	1	J	1	J	µg/kg	12SS04-00	1/8	2B - 3B	1	ND	1.56E+06 N	N/A	N/A	NO	BSL
	Semivolatiles (ug/kg)															
208-96-8	Acenaphthylene	15	J	15	J	µg/kg	12SS08-00	1/8	360U - 370U	15	ND	4.69E+05 N (5)	N/A	N/A	NO	BSL
120-12-7	Anthracene	19	J	19	J	µg/kg	12SS08-00	1/8	360U - 370U	19	ND	2.35E+06 N	N/A	N/A	NO	BSL
56-55-3	Benzo(a)anthracene	140	J	140	J	µg/kg	12SS08-00	1/8	360U - 370U	140	ND	8.75E+02 C	N/A	N/A	YES	CHEM
50-32-8	Benzo(a)pyrene	140	J	140	J	µg/kg	12SS08-00	1/8	360U - 370U	140	ND	8.75E+01 C	N/A	N/A	YES	ASL
205-99-2	Benzo(b)fluoranthene	350	J	350	J	µg/kg	12SS08-00	1/8	360U - 370U	350	ND	8.75E+02 C	N/A	N/A	YES	CHEM
191-24-2	Benzo(g,h,i)perylene	77	J	77	J	µg/kg	12SS08-00	1/8	360U - 370U	77	ND	2.35E+05 N (6)	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	310	J	310	J	µg/kg	12SS08-00	1/8	360U - 370U	310	ND	8.75E+03 C	N/A	N/A	YES	CHEM
117-81-7	Bis(2-ethylhexyl) Phthalate	600		600		µg/kg	12SS08-00	1/8	28B - 130B	600	130J - 600	4.56E+04 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	250	J	250	J	µg/kg	12SS08-00	1/8	360U - 370U	250	ND	8.75E+04 C	N/A	N/A	YES	CHEM
53-70-3	Dibenz(a,h)anthracene	37	J	37	J	µg/kg	12SS08-00	1/8	360U - 370U	37	ND	8.75E+01 C	N/A	N/A	YES	CHEM
117-84-0	Di-n-octyl Phthalate	27	J	38	J	µg/kg	12SS04-00	3/8	360U - 370U	38	ND	1.56E+05 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	370		370		µg/kg	12SS08-00	1/8	360U - 370U	370	ND	3.13E+05 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	93	J	93	J	µg/kg	12SS08-00	1/8	360U - 370U	93	ND	8.75E+02 C	N/A	N/A	YES	CHEM
85-01-8	Phenanthrene	20	J	20	J	µg/kg	12SS08-00	1/8	360U - 370U	20	ND	2.35E+05 N (6)	N/A	N/A	NO	BSL
129-00-0	Pyrene	660		660		µg/kg	12SS08-00	1/8	360U - 370U	660	ND	2.35E+05 N	N/A	N/A	NO	BSL
	Pesticides/PCBs (ug/kg)															
5103-74-2	Chlordane, gamma-	6	J	6	J	µg/kg	12SS08-00	1/8	1.9U - 1.9U	6	1	1.82E+03 C (7)	N/A	N/A	NO	BSL
	Inorganics (mg/kg)															
7429-90-5	Aluminum	6,190		11,400		mg/kg	12SS04-00	8/8	(4)	11,400	3110 - 6160	7.82E+03 N	N/A	N/A	YES	ASL
7440-39-3	Barium	12	J	42.3	J	mg/kg	12SS06-00	8/8	(4)	42.3	6J - 46.4	5.48E+02 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	230	J	761	J	mg/kg	12SS04-00	8/8	(4)	761	45.8J - 925J	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	5.3		9.9		mg/kg	12SS04-00	8/8	(4)	9.9	2.7 - 9	2.35E+01 N (8)	N/A	N/A	NO	BSL
7440-48-4	Cobalt	0.63	J	3.1	J	mg/kg	12SS04-00	8/8	(4)	3.1	0.56J - 5.3J	1.56E+02 N	N/A	N/A	NO	BSL
7440-50-8	Copper	4.9	J	8.9		mg/kg	12SS04-00	8/8	(4)	8.9	0.9J - 1.7J	3.13E+02 N	N/A	N/A	NO	BSL
7439-89-6	Iron	4,640		8,950		mg/kg	12SS04-00	8/8	(4)	8,950	2150 - 8240	2.35E+03 N	N/A	N/A	YES	ASL
7439-92-1	Lead	5.3	K	7.9	K	mg/kg	12SS06-00	8/8	(4)	7.9	6.7 - 12.2	4.00E+02 N (9)	N/A	N/A	NO	BSL
7439-95-4	Magnesium	219	J	322	J	mg/kg	12SS04-00	8/8	(4)	322	137J - 237J	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	8.2	J	80.2	J	mg/kg	12SS04-00	8/8	(4)	80.2	19.2 - 278	1.56E+02 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	1.6	J	3.5	J	mg/kg	12SS04-00	8/8	(4)	3.5	1.7J - 4.4J	1.56E+02 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	207	J	339	J	mg/kg	12SS06-00	8/8	(4)	339	307	N/A	N/A	N/A	NO	NUT
7782-49-2	Selenium	0.63	J	0.63	J	mg/kg	12SS04-00	1/8	0.42UL - 0.46UL	0.63	1	3.91E+01 N	N/A	N/A	NO	BSL
7440-23-5	Sodium	36.3	J	70	J	mg/kg	12SS04-00	8/8	(4)	70	ND	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	10.5	J	17.9		mg/kg	12SS06-00	8/8	(4)	17.9	5J - 22.1	5.48E+01 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	5.3	K	10.2		mg/kg	12SS06-00	8/8	(4)	10.2	3.6J - 12.2	2.35E+03 N	N/A	N/A	NO	BSL

(1) Cheatham Annex Background Investigation, draft (Baker, 2002): Range of positive detects
(2) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals
USEPA Region III COC Screening Value (derived from USEPA Region III RBC Table - October, 2002)
(3) Rationale Codes
Selection Reason: Same chemical class (CHEM)
Above Screening Levels (ASL)
Deletion Reason: Essential Nutrient (NUT)
Below Screening Level (BSL)
(4) No detection limits given; analyte detected in every sample.
(5) Screening value for acenaphthene used as a surrogate.
(6) Screening value for pyrene used as a surrogate.
(7) Screening value for chlordane used as a surrogate.
(8) Screening value for chromium VI used.
(9) Action level for lead.

Definitions: N/A = Not applicable
ND = Not Detected
COPC = Chemical of Potential Concern
ARAR/TBC = arplicable or Relevant and arpropriate Requirement/To Be Considered

J - Analyte present - Reported value is estimated
K - Analyte present - Reported value is biased high
B - Constituent was detected in a blank
U - Not detected
UL - Reported quantitation limit is qualified as biased low

C = Carcinogenic
N = Non-Carcinogenic

mg/kg = milligrams per kilogram
ug/kg = microgram per kilogram

TABLE 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

CAS Number	Chemical	Minimum Concentration	Minimum Qualifier	Maximum Concentration	Maximum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening	Background Value (1)	Screening (2) Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for (3) Contaminant Deletion or Selection
	Volatiles (ug/kg)															
108-88-3	Toluene	1	J	1	J	µg/kg	12SB06-01,12SB07-01,12SB08-01	3/8	1B - 2B	1	ND	1.56E+06 N	N/A	N/A	NO	BSL
	Semivolatiles (ug/kg)															
56-55-3	Benzo(a)anthracene	41	J	41	J	µg/kg	12SB08-01	1/8	370U - 390U	41	ND	8.75E+02 C	N/A	N/A	NO	BSL
50-32-8	Benzo(a)pyrene	46	J	46	J	µg/kg	12SB08-01	1/8	370U - 390U	46	ND	8.75E+01 C	N/A	N/A	NO	BSL
205-99-2	Benzo(b)fluoranthene	97	J	97	J	µg/kg	12SB08-01	1/8	370U - 390U	97	ND	8.75E+02 C	N/A	N/A	NO	BSL
207-08-9	Benzo(k)fluoranthene	96	J	96	J	µg/kg	12SB08-01	1/8	370U - 390U	96	ND	8.75E+03 C	N/A	N/A	NO	BSL
117-81-7	Bis(2-ethylhexyl) Phthalate	320	J	570		µg/kg	12SB05-01	2/8	43B - 330B	570	41J - 140J	4.56E+04 C	N/A	N/A	NO	BSL
218-01-9	Chrysene	82	J	82	J	µg/kg	12SB08-01	1/8	370U - 390U	82	ND	8.75E+04 C	N/A	N/A	NO	BSL
117-84-0	Di-n-octyl Phthalate	15	J	25	J	µg/kg	12SB06-01	2/8	370U - 390U	25	ND	1.56E+05 N	N/A	N/A	NO	BSL
206-44-0	Fluoranthene	110	J	110	J	µg/kg	12SB08-01	1/8	370U - 390U	110	ND	3.13E+05 N	N/A	N/A	NO	BSL
193-39-5	Indeno(1,2,3-cd)pyrene	33	J	33	J	µg/kg	12SB08-01	1/8	370U - 390U	33	ND	8.75E+02 C	N/A	N/A	NO	BSL
91-20-3	Naphthalene	33	J	33	J	µg/kg	12SB02-01	1/8	370U - 380U	33	ND	1.56E+05 N	N/A	N/A	NO	BSL
129-00-0	Pyrene	140	J	140	J	µg/kg	12SB08-01	1/8	370U - 390U	140	ND	2.35E+05 N	N/A	N/A	NO	BSL
	Inorganics (mg/kg)															
7429-90-5	Aluminum	3,990		7,300		mg/kg	12SB01-01	8/8	(4)	7,300	1920 - 10900	7.82E+03 N	N/A	N/A	NO	BSL
7440-39-3	Barium	5.3	J	14.7	J	mg/kg	12SB06-01	8/8	(4)	14.7	8.2J - 47.8	5.48E+02 N	N/A	N/A	NO	BSL
7440-70-2	Calcium	160	J	876	J	mg/kg	12SB05-01	8/8	(4)	876	56.4J - 304J	N/A	N/A	N/A	NO	NUT
7440-47-3	Chromium	4		9.9		mg/kg	12SB07-01	8/8	(4)	9.9	2.9 - 15.6	2.35E+01 N (5)	N/A	N/A	NO	BSL
7440-48-4	Cobalt	0.16	J	0.36	J	mg/kg	12SB01-01	4/8	0.15U - 0.16U	0.36	0.84J - 8.1J	1.56E+02 N	N/A	N/A	NO	BSL
7440-50-8	Copper	3.6	J	5.2	J	mg/kg	12SB01-01	8/8	(4)	5.2	0.71J - 2.4J	3.13E+02 N	N/A	N/A	NO	BSL
7439-89-6	Iron	2,830	J	9,100	J	mg/kg	12SB01-01	8/8	(4)	9,100	1740 - 12500	2.35E+03 N	N/A	N/A	YES	ASL
7439-92-1	Lead	4.1		5.5		mg/kg	12SB07-01	8/8	(4)	5.5	3.2 - 6.7	4.00E+02 N (6)	N/A	N/A	NO	BSL
7439-95-4	Magnesium	217	J	281	J	mg/kg	12SB07-01	4/8	143B - 193B	281	115J - 392J	N/A	N/A	N/A	NO	NUT
7439-96-5	Manganese	2.4	J	11.2	J	mg/kg	12SB04-01	8/8	(4)	11.2	5.4 - 208	1.56E+02 N	N/A	N/A	NO	BSL
7440-02-0	Nickel	0.36	J	1.8	J	mg/kg	12SB01-01	8/8	(4)	1.8	1.8J - 6.4J	1.56E+02 N	N/A	N/A	NO	BSL
7440-09-7	Potassium	228	J	271	J	mg/kg	12SB01-01	3/8	146B - 215B	271	278	N/A	N/A	N/A	NO	NUT
7440-23-5	Sodium	37.9	J	67.5	J	mg/kg	12SB07-01	8/8	(4)	67.5	ND	N/A	N/A	N/A	NO	NUT
7440-62-2	Vanadium	13.2		33.5		mg/kg	12SB07-01	8/8	(4)	33.5	3.4J - 36	5.48E+01 N	N/A	N/A	NO	BSL
7440-66-6	Zinc	2.6	J	13.9		mg/kg	12SB07-01	7/8	1.9B - 1.9B	13.9	5L - 13.8	2.35E+03 N	N/A	N/A	NO	BSL

(1) Cheatham Annex Background Investigation, draft (Baker, 2002): Range of positive detects
(2) All non-carcinogenic criteria were divided by 10 to account for potential additive effects of chemicals
USEPA Region III COC Screening Value (derived from USEPA Region III RBC Table - October, 2002)
(3) Rationale Codes Selection Reason: Above Screening Levels (ASL)
Deletion Reason: Essential Nutrient (NUT)
Below Screening Level (BSL)

(4) No detection limits given; analyte detected in every sample.
(5) Screening value for chromium VI used.
(6) Action level for lead.

Definitions: N/A = Not applicable
ND = Not Detected
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered

J - Analyte present - Reported value is estimated
B - Constituent was detected in a blank
U - Not detected

C = Carcinogenic mg/kg = milligrams per kilogram
N = Non-Carcinogenic ug/kg = microgram per kilogram

TABLE 3.1
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

Chemical of Potential Concern	Units	Arithmetic Mean	95% Upper Confidence Level (95% UCL)	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Benzo(a)anthracene	mg/kg	0.178	0.188	0.14	J	mg/kg	0.14	Max	(2)	0.14	Max	(2)
Benzo(a)pyrene	mg/kg	0.178	0.188	0.14	J	mg/kg	0.14	Max	(2)	0.14	Max	(2)
Benzo(b)fluoranthene	mg/kg	0.204	0.243	0.35	J	mg/kg	0.243	W-Normal	(1)	0.243	W-Normal	(1)
Benzo(k)fluoranthene	mg/kg	0.199	0.229	0.31	J	mg/kg	0.229	W-Normal	(1)	0.229	W-Normal	(1)
Chrysene	mg/kg	0.191	0.207	0.25	J	mg/kg	0.207	W-Normal	(1)	0.207	W-Normal	(1)
Dibenz(a,h)anthracene	mg/kg	0.165	0.199	0.037	J	mg/kg	0.037	Max	(2)	0.037	Max	(2)
Indeno(1,2,3-cd)pyrene	mg/kg	0.172	0.193	0.093	J	mg/kg	0.093	Max	(2)	0.093	Max	(2)
Aluminum	mg/kg	8,330	9,472	11,400		mg/kg	9,472	W-Normal	(1)	9,472	W-Normal	(1)
Iron	mg/kg	6,625	7,589	8,950		mg/kg	7,589	W-Normal	(1)	7,589	W-Normal	(1)

EPC = Exposure Point Concentration
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

(1) Conservative estimate of the arithmetic average concentration (95% UCL), based on the Shapiro-Wilks (W-) or D-Agostino (D-) distribution tests
(2) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

TABLE 3.2
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

Chemical of Potential Concern	Units	Arithmetic Mean	95% Upper Confidence Level (95% UCL)	Maximum Detected Concentration	Maximum Qualifier	EPC Units	Reasonable Maximum Exposure			Central Tendency		
							Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale	Medium EPC Value	Medium EPC Statistic	Medium EPC Rationale
Iron	mg/kg	5,758	7,359	9,100	J	mg/kg	7,359	W-Normal	(1)	7,359	W-Normal	(1)

EPC = Exposure Point Concentration
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration.

(1) Conservative estimate of the arithmetic average concentration (95% UCL), based on the Shapiro-Wilks (W-) or D-Agostino (D-) distribution tests

TABLE 4.1.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespassers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1989	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	52	Prof Judge	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	5,700	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.07	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	52	Prof Judge	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.1.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Trespassers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	USEPA, 1991	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	12	USEPA, 1997	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	52	Prof Judge	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.2.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespassers
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1989	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	52	Prof Judge	--	--	
	ED	Exposure Duration	years	9	USEPA, 1991	--	--	
	BW	Body Weight	kg	45	USEPA, 1997	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	5,300	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.2	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	52	Prof Judge	--	--	
	ED	Exposure Duration	years	9	USEPA, 1991	--	--	
	BW	Body Weight	kg	45	USEPA, 1997	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.2.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Trespassers
Receptor Age: Adolescent

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	USEPA, 1991	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	12	USEPA, 1997	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	52	Prof Judge	--	--	
	ED	Exposure Duration	years	9	USEPA, 1991	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	45	USEPA, 1997	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	3,285	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.3.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: On-Site Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	50	USEPA, 1991	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	25	USEPA, 1991	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	3,300	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.2	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	25	USEPA, 1991	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.3.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: On-Site Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	USEPA, 1989	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	8	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	25	USEPA, 1991	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
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USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.4.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1989	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	5,700	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.07	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.4.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	USEPA, 1991	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	24	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.4.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1989	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	5,700	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.07	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

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Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.4.2a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	USEPA, 1991	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	24	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	24	USEPA, 1989	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	8,760	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
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TABLE 4.5.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	USEPA, 1989	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	6	USEPA, 1989	--	--	
	BW	Body Weight	kg	15	USEPA, 1991	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	2,800	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.2	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	6	USEPA, 1989	--	--	
	BW	Body Weight	kg	15	USEPA, 1991	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

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Prof Judge - Professional Judgement
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Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
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USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
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TABLE 4.5.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	Prof Judge	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	24	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	6	USEPA, 1989	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	15	USEPA, 1991	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.5.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	200	USEPA, 1989	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	6	USEPA, 1989	--	--	
	BW	Body Weight	kg	15	USEPA, 1991	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	2,800	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.2	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	6	USEPA, 1989	--	--	
	BW	Body Weight	kg	15	USEPA, 1991	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.5.2a
VALUES USED FOR DAILY INTAKE CALCULATION
SITE 12 (DISPOSAL SITE NEAR WATER TOWER
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOW
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	0.83	Prof Judge	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	24	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	350	USEPA, 1991	--	--	
	ED	Exposure Duration	years	6	USEPA, 1989	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	15	USEPA, 1991	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	2,190	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
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USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
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USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.6.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Industrial / Commercial Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	100	USEPA, 1993	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	Prof Judge	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 2001	--	--	
	ED	Exposure Duration	years	25	USEPA, 2001	--	--	
	BW	Body Weight	kg	70	USEPA, 1997	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	3,300	USEPA, 2001	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.07	USEPA, 2001	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 2001	--	--	
	ED	Exposure Duration	years	25	USEPA, 2001	--	--	
	BW	Body Weight	kg	70	USEPA, 1997	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.6.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Industrial / Commercial Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	1.1	USEPA, 1997	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	8	USEPA, 1991	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	250	USEPA, 2001	--	--	
	ED	Exposure Duration	years	25	USEPA, 2001	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1997	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	9,125	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
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USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.7.1
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	USEPA, 1997	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	1	Prof Judge	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	3,300	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.2	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	1	Prof Judge	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

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Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
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USEPA, 1995: Assessing Dermal Exposure from Soil.
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TABLE 4.7.1a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	2.5	USEPA, 1997	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	8	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	1	Prof Judge	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

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Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
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USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 4.7.2
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Ingestion	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	Chronic Daily Intake (CDI) (mg/kg-day) =
	IR-S	Ingestion Rate of Soil	mg/day	480	USEPA, 1997	--	--	C x IR x CF x Fi x EF x ED x 1/BW x 1/AT
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	
	FI	Fraction Ingested from Source	NA	1	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	1	Prof Judge	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	--	--	
Dermal	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	CF	Conversion Factor	kg/mg	1.00E-06	USEPA, 1989	--	--	C x CF x SA x AF x ABS x EF x ED x
	SA	Surface Area Available for Contact	cm2/day	3,300	USEPA, 1997	--	--	1/BW x1/AT
	AF	Soil to Skin Adherence Factor	mg/cm2	0.2	USEPA, 1997	--	--	
	ABS	Absorption Factor	NA	(1)	USEPA, 1995	--	--	
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	1	Prof Judge	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

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USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
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USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
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TABLE 4.7.2a
VALUES USED FOR DAILY INTAKE CALCULATIONS
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Construction Workers
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	CT Value	CT Rationale/ Reference	Intake Equation/ Model Name
Inhalation	C	Contaminant Concentration in Soil	mg/kg	Chemical Specific	Chemical Specific	--	--	CDI (mg/kg-day) =
	RR	Respiration Rate	m3/hour	2.5	USEPA, 1997	--	--	C x IR x ET x EF x ED x 1/PEF x
	ET	Exposure Time	hours/day	8	Prof Judge	--	--	1/BW x1/AT
	EF	Exposure Frequency	days/year	250	USEPA, 1991	--	--	
	ED	Exposure Duration	years	1	Prof Judge	--	--	
	PEF	Particulate Emission Factor	m3/kg	1.32E+09	Cowherd, et al., 1995	--	--	
	BW	Body Weight	kg	70	USEPA, 1989	--	--	
	AT-C	Averaging Time (Cancer)	days	25,550	USEPA, 1989	--	--	
	AT-N	Averaging Time (Non-Cancer)	days	365	USEPA, 1989	--	--	

Notes

(1) USEPA Region III default values of 0.05% and 3.0% for VOCs; 10% for SVOCs, Nitramines, Pesticides, Herbicides and TPH; 6% for PCBs; 3.2% for arsenic, and 1% for inorganics were used for ABS values.
(1) USEPA Region IV default values of 0.01% organics and 0.001% for inorganics were used for ABS values.

NA - Not Applicable
Prof Judge - Professional Judgement
Std Tour of Duty - Standard Tour of Duty

Sources:

Cowherd, et al., 1995: Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination. OHEA. EPA/600/8-85/002.
USEPA, 1989: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
USEPA, 1991: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Standard Default Exposure Factors.
USEPA, 1992: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual Supplemental Guidance: Dermal Risk Assessment.
USEPA, 1993: "Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure." November, 1993.
USEPA, 1995: Assessing Dermal Exposure from Soil.
USEPA, 1996: Supplemental Guidance to RAGS: Region IV Bulletins. Office of Health Assessment. Atlanta, GA. October, 1996.
USEPA, 1997: Exposure Factors Handbook. Vol. 1: General Factors. ORD. EPA/600/P-95/002Fa.
USEPA, 2001: Risk Assessment Guidance for Superfund Vol 1, Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R-99/005.

TABLE 5.1
NON-CANCER TOXICITY DATA -- ORAL/DERMAL
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (3) (MM/DD/YY)
Benzo(a)anthracene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Chrysene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	(mg/kg/day)	100%	NA	(mg/kg/day)	NA	NA	NA	NA
Aluminum	Chronic	1.00E+00	(mg/kg/day)	100%	1.00E+00	(mg/kg/day)	CNS	100/1	NCEA	4/26/2000
Iron	Chronic	3.00E-01	(mg/kg/day)	100%	3.00E-01	(mg/kg/day)	Liver / CVS / GIS	NA	NCEA	4/26/2000

Notes:

(1) Refer to RAGS, Part E
(2) Adjusted dermal RfD = Oral RfD * Adj Factor
(3) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.

NA = Not Applicable

Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

Sources:
NCEA = National Center for Environmental Assessment, USEPA

TABLE 5.2
NON-CANCER TOXICITY DATA -- INHALATION
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (2) (MM/DD/YY)
Benzo(a)anthracene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA
Aluminum	Chronic	NA	NA	1.00E-03	mg/kg/day	CNS	100/1	NCEA	4/26/2000
Iron	NA	NA	NA	NA	mg/kg/day	NA	NA	NA	NA

Notes:

(1) Provide equation used for derivation in text.
(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.

NA = Not Applicable

Target Organ Abbreviations:
CNS = Central Nervous System

Sources:
NCEA = National Center for Environmental Assessment, USEPA

TABLE 6.1
CANCER TOXICITY DATA -- ORAL/DERMAL
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (3) (MM/DD/YY)
Benzo(a)anthracene	7.30E-01	100%	7.30E-01	$(mg/kg/day)^{-1}$	B2	NCEA	4/26/2000
Benzo(a)pyrene	7.30E+00	100%	7.30E+00	$(mg/kg/day)^{-1}$	B2	IRIS	9/20/2002
Benzo(b)fluoranthene	7.30E-01	100%	7.30E-01	$(mg/kg/day)^{-1}$	B2	NCEA	4/26/2000
Benzo(k)fluoranthene	7.30E-02	100%	7.30E-02	$(mg/kg/day)^{-1}$	B2	NCEA	4/26/2000
Chrysene	7.30E-03	100%	7.30E-03	$(mg/kg/day)^{-1}$	B2	NCEA	4/26/2000
Dibenz(a,h)anthracene	7.30E+00	100%	7.30E+00	$(mg/kg/day)^{-1}$	B2	NCEA	4/26/2000
Indeno(1,2,3-cd)pyrene	7.30E-01	100%	7.30E-01	$(mg/kg/day)^{-1}$	B2	NCEA	4/26/2000
Aluminum	NA	100%	NA	$(mg/kg/day)^{-1}$	D	NA	NA
Iron	NA	100%	NA	$(mg/kg/day)^{-1}$	D	NA	NA

Notes:

(1) Refer to RAGS, Part E
(2) Adjusted dermal CSF = Oral CSF / Adj Factor
(3) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide article date provided by NCEA.

NA = Not Applicable

Sources:
IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment, USEPA

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

Weight of Evidence:
Known/Likely (EPA classes A, B1, B2, C)
Cannot be Determined (EPA class D)
Not Likely (EPA class E)

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (2) (MM/DD/YY)
Benzo(a)anthracene	NA	NA	NA	NA	mg/kg/day	D	NA	NA
Benzo(a)pyrene	8.9E-04	ug/m3	3,500	3.10E+00	mg/kg/day	B2	NCEA	4/26/2000
Benzo(b)fluoranthene	NA	NA	NA	NA	mg/kg/day	B2	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	mg/kg/day	B2	NA	NA
Chrysene	NA	NA	NA	NA	mg/kg/day	B2	IRIS	9/20/2002
Dibenz(a,h)anthracene	NA	NA	NA	NA	mg/kg/day	D	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	mg/kg/day	B2	IRIS	9/20/2002
Aluminum	NA	NA	NA	NA	mg/kg/day	D	NA	NA
Iron	NA	NA	NA	NA	mg/kg/day	D	NA	NA

Notes:

(1) Adjustment Factor applied to Unit Risk to calculate Inhalation Slope Factor = 70kg x 1/20m3/day x 1000ug/mg
(2) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.

NA = Not Applicable

Sources:
IRIS = Integrated Risk Information System
NCEA = National Center for Environmental Assessment, USEPA

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

Weight of Evidence:
Known/Likely (EPA classes A, B1, B2, C)
Cannot be Determined (EPA class D)
Not Likely (EPA class E)

TABLE 7.1.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespassers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	2.8E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	2.8E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	5.0E-08	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	4.7E-08	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	4.2E-08	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	7.5E-09	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	1.9E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	1.9E-03	mg/kg-day	1.0E+00	mg/kg-day	--	--	1.9E-03
	Iron	7,589	mg/kg	7,589	mg/kg	M	1.5E-03	mg/kg-day	3.0E-01	mg/kg-day	--	--	5.1E-03
	(Total)												7.1E-03
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.5E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.5E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.6E-08	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	2.4E-08	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.2E-08	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	3.9E-09	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	9.8E-09	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	7.7E-05	mg/kg-day	1.0E+00	mg/kg-day	--	--	7.7E-05
	Iron	7,589	mg/kg	7,589	mg/kg	M	6.2E-05	mg/kg-day	3.0E-01	mg/kg-day	--	--	2.1E-04
	(Total)												2.8E-04
										Total Hazard Index Across All Exposure Routes/Pathways			7.4E-03

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.1.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Trespassers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.1E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.1E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	3.7E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	3.5E-12	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	3.2E-12	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	5.7E-13	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	1.4E-12	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	1.5E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	--	1.5E-04
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.2E-07	mg/kg-day	NA	--	NA	--	--
	(Total)												1.5E-04
							Total Hazard Index Across All Exposure Routes/Pathways						1.5E-04

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.2.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespassers
Receptor Age: Adolescent

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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	4.4E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	4.4E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	7.7E-08	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	7.2E-08	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	6.6E-08	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.2E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	2.9E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	3.0E-03	mg/kg-day	1.0E+00	mg/kg-day	--	--	3.0E-03
	Iron	7,589	mg/kg	7,589	mg/kg	M	2.4E-03	mg/kg-day	3.0E-01	mg/kg-day	--	--	8.0E-03
	(Total)												1.1E-02
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	6.1E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	6.1E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.1E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.0E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	9.0E-08	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.6E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	4.1E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	3.2E-04	mg/kg-day	1.0E+00	mg/kg-day	--	--	3.2E-04
	Iron	7,589	mg/kg	7,589	mg/kg	M	2.5E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	8.5E-04
	(Total)												1.2E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.2E-02

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.2.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Trespassers
Receptor Age: Adolescent

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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	3.3E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	3.3E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	5.8E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	5.5E-12	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	5.0E-12	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	8.8E-13	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	2.2E-12	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	2.3E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	--	2.3E-04
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.8E-07	mg/kg-day	NA	--	NA	--	--
	(Total)												2.3E-04
							Total Hazard Index Across All Exposure Routes/Pathways						2.3E-04

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.3.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: On-Site Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	6.8E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	6.8E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.2E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.1E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.0E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.8E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	4.5E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	4.6E-03	mg/kg-day	1.0E+00	mg/kg-day	--	--	4.6E-03
	Iron	7,589	mg/kg	7,589	mg/kg	M	3.7E-03	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.2E-02
	(Total)												1.7E-02
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.2E-07	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.2E-07	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.0E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.9E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.7E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	3.1E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	7.8E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	6.1E-04	mg/kg-day	1.0E+00	mg/kg-day	--	--	6.1E-04
	Iron	7,589	mg/kg	7,589	mg/kg	M	4.9E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.6E-03
	(Total)												2.2E-03
										Total Hazard Index Across All Exposure Routes/Pathways			1.9E-02

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.3.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: On-Site Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	6.9E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	6.9E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	1.2E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	1.1E-11	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	1.0E-11	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	1.8E-12	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	4.6E-12	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	4.7E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	--	4.7E-04
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	3.7E-07	mg/kg-day	NA	--	NA	--	--
	(Total)												4.7E-04
							Total Hazard Index Across All Exposure Routes/Pathways						4.7E-04

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.4.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Residents
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.9E-07	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.9E-07	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	3.3E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	3.1E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.8E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	5.1E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	1.3E-07	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	1.3E-02	mg/kg-day	1.0E+00	mg/kg-day	--	--	1.3E-02
	Iron	7,589	mg/kg	7,589	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	--	--	3.5E-02
	(Total)												4.8E-02
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	9.9E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	9.9E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.7E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.6E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.5E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	2.6E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	6.6E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	5.2E-04	mg/kg-day	1.0E+00	mg/kg-day	--	--	5.2E-04
	Iron	7,589	mg/kg	7,589	mg/kg	M	4.1E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.4E-03
	(Total)												1.9E-03
										Total Hazard Index Across All Exposure Routes/Pathways			5.0E-02

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.4.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.9E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.9E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	5.0E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	4.7E-11	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	4.3E-11	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	7.6E-12	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	1.9E-11	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	2.0E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	--	2.0E-03
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.6E-06	mg/kg-day	NA	--	NA	--	--
	(Total)												2.0E-03
							Total Hazard Index Across All Exposure Routes/Pathways						2.0E-03

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.4.2 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Residents
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	7,359	mg/kg	7,359	mg/kg	M	1.0E-02	mg/kg-day	3.0E-01	mg/kg-day	--	--	3.4E-02
	(Total)												3.4E-02
Dermal	Iron	7,359	mg/kg	7,359	mg/kg	M	4.0E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.3E-03
	(Total)												1.3E-03
								Total Hazard Index Across All Exposure Routes/Pathways					3.5E-02

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.4.2a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Iron	7,359	mg/kg	5.57E-06	mg/m^3	R	1.5E-06	mg/kg-day	NA	--	NA	--	--
	(Total)												--
							Total Hazard Index Across All Exposure Routes/Pathways						--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.5.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.8E-06	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.8E-06	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	3.1E-06	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	2.9E-06	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.6E-06	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	4.7E-07	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	1.2E-06	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	1.2E-01	mg/kg-day	1.0E+00	mg/kg-day	--	--	1.2E-01
	Iron	7,589	mg/kg	7,589	mg/kg	M	9.7E-02	mg/kg-day	3.0E-01	mg/kg-day	--	--	3.2E-01
	(Total)												4.4E-01
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	6.5E-07	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	6.5E-07	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.1E-06	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.1E-06	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	9.6E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.7E-07	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	4.3E-07	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	3.4E-03	mg/kg-day	1.0E+00	mg/kg-day	--	--	3.4E-03
	Iron	7,589	mg/kg	7,589	mg/kg	M	2.7E-03	mg/kg-day	3.0E-01	mg/kg-day	--	--	9.1E-03
	(Total)												1.2E-02
												Total Hazard Index Across All Exposure Routes/Pathways	4.6E-01

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.5.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	1.4E-10	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	1.4E-10	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	2.3E-10	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	2.2E-10	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	2.0E-10	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	3.6E-11	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	9.0E-11	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	9.1E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	--	9.1E-03
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	7.3E-06	mg/kg-day	NA	--	NA	--	--
	(Total)												9.1E-03
							Total Hazard Index Across All Exposure Routes/Pathways						9.1E-03

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.5.2 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	7,359	mg/kg	7,359	mg/kg	M	9.4E-02	mg/kg-day	3.0E-01	mg/kg-day	--	--	3.1E-01
	(Total)												3.1E-01
Dermal	Iron	7,359	mg/kg	7,359	mg/kg	M	2.6E-03	mg/kg-day	3.0E-01	mg/kg-day	--	--	8.8E-03
	(Total)												8.8E-03
												Total Hazard Index Across All Exposure Routes/Pathways	3.2E-01

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.5.2a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Hazard Calculation (1)	Intake (Non-Cancer)	Intake (Non-Cancer) Units	Reference Dose (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Iron (Total)	7,359	mg/kg	5.57E-06	mg/m^3	R	7.1E-06	mg/kg-day	NA	--	NA	--	--
													--
							Total Hazard Index Across All Exposure Routes/Pathways						--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.6.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Industrial / Commercial Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.4E-07	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.4E-07	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.4E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	2.2E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.0E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	3.6E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	9.1E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	9.3E-03	mg/kg-day	1.0E+00	mg/kg-day	--	--	9.3E-03
	Iron	7,589	mg/kg	7,589	mg/kg	M	7.4E-03	mg/kg-day	3.0E-01	mg/kg-day	--	--	2.5E-02
	(Total)												3.4E-02
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	4.1E-08	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	4.1E-08	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	7.2E-08	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	6.7E-08	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	6.1E-08	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.1E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	2.7E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	2.1E-04	mg/kg-day	1.0E+00	mg/kg-day	--	--	2.1E-04
	Iron	7,589	mg/kg	7,589	mg/kg	M	1.7E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	5.7E-04
	(Total)												7.9E-04
												Total Hazard Index Across All Exposure Routes/Pathways	3.5E-02

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.6.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Industrial / Commercial Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	9.1E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	9.1E-12	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	1.6E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	1.5E-11	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	1.4E-11	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	2.4E-12	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	6.1E-12	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	6.2E-07	mg/kg-day	1.0E-03	mg/kg-day	NA	--	6.2E-04
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	5.0E-07	mg/kg-day	NA	--	NA	--	--
	(Total)												6.2E-04
							Total Hazard Index Across All Exposure Routes/Pathways						6.2E-04

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.7.1 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Construction Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	6.6E-07	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	6.6E-07	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.1E-06	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.1E-06	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	9.7E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.7E-07	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	4.4E-07	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	4.4E-02	mg/kg-day	1.0E+00	mg/kg-day	--	--	4.4E-02
	Iron	7,589	mg/kg	7,589	mg/kg	M	3.6E-02	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.2E-01
	(Total)												1.6E-01
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.2E-07	mg/kg-day	NA	--	--	--	--
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.2E-07	mg/kg-day	NA	--	--	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.0E-07	mg/kg-day	NA	--	--	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.9E-07	mg/kg-day	NA	--	--	--	--
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.7E-07	mg/kg-day	NA	--	--	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	3.1E-08	mg/kg-day	NA	--	--	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	7.8E-08	mg/kg-day	NA	--	--	--	--
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	6.1E-04	mg/kg-day	1.0E+00	mg/kg-day	--	--	6.1E-04
	Iron	7,589	mg/kg	7,589	mg/kg	M	4.9E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.6E-03
	(Total)												2.2E-03
												Total Hazard Index Across All Exposure Routes/Pathways	1.7E-01

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.7.1a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Construction Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.1E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.1E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	3.6E-11	mg/kg-day	NA	--	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	3.4E-11	mg/kg-day	NA	--	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	3.1E-11	mg/kg-day	NA	--	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	5.5E-12	mg/kg-day	NA	--	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	1.4E-11	mg/kg-day	NA	--	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	1.4E-06	mg/kg-day	1.0E-03	mg/kg-day	NA	--	1.4E-03
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.1E-06	mg/kg-day	NA	--	NA	--	--
	(Total)												1.4E-03
							Total Hazard Index Across All Exposure Routes/Pathways						1.4E-03

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.7.2 RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Construction Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Ingestion	Iron	7,359	mg/kg	7,359	mg/kg	M	3.5E-02	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.2E-01
	(Total)												1.2E-01
Dermal	Iron	7,359	mg/kg	7,359	mg/kg	M	4.8E-04	mg/kg-day	3.0E-01	mg/kg-day	--	--	1.6E-03
	(Total)												1.6E-03
								Total Hazard Index Across All Exposure Routes/Pathways					1.2E-01

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 7.7.2a RME
CALCULATION OF NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Construction Workers
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 (2)	Reference Dose Units	Reference Concentration	Reference Concentration Units	Hazard Quotient
Inhalation	Iron	7,359	mg/kg	5.57E-06	mg/m^3	R	1.1E-06	mg/kg-day	NA	--	NA	--	--
	(Total)												--
							Total Hazard Index Across All Exposure Routes/Pathways						--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for hazard calculation.
(2) Specify if subchronic.

TABLE 8.1.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespassers
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	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	9.8E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.1E-09
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	9.8E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	7.1E-08
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.7E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.2E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.6E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	1.2E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.4E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	1.1E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	2.6E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.9E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	6.5E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.7E-09
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	6.6E-04	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	5.3E-04	mg/kg-day	NA	--	--
	(Total)										1.2E-07
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	5.1E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.7E-09
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	5.1E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.7E-08
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	8.8E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	6.4E-09
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	8.3E-09	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	6.0E-10
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	7.5E-09	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	5.5E-11
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.3E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	9.8E-09
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	3.4E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.5E-09
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	2.6E-05	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	2.1E-05	mg/kg-day	NA	--	--
	(Total)										6.0E-08
										Total Risk Across All Exposure Routes/Pathways	1.8E-07

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.1.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Trespassers
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
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	7.4E-13	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	7.4E-13	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	2.3E-12
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	1.3E-12	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	1.2E-12	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	1.1E-12	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	1.9E-13	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	4.9E-13	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	5.0E-08	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	4.0E-08	mg/kg-day	NA	--	--
	(Total)										2.3E-12
										Total Risk Across All Exposure Routes/Pathways	2.3E-12

NOTES:

EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.

mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.2.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Trespassers
Receptor Age: Adolescent

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	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	5.7E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.2E-09
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	5.7E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	4.2E-08
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	9.9E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.2E-09
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	9.3E-09	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	6.8E-10
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	8.4E-09	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	6.2E-11
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.5E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	3.8E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.8E-09
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	3.9E-04	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	3.1E-04	mg/kg-day	NA	--	--
	(Total)										6.7E-08
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	7.9E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	5.7E-09
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	7.9E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	5.7E-08
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.0E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.3E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	9.4E-10
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.2E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	8.5E-11
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	2.1E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.5E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	5.2E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.8E-09
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	4.1E-05	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	3.3E-05	mg/kg-day	NA	--	--
	(Total)										9.3E-08
										Total Risk Across All Exposure Routes/Pathways	1.6E-07

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.2.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Trespassers
Receptor Age: Adolescent

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
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	4.3E-13	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	4.3E-13	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	1.3E-12
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	7.5E-13	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	7.0E-13	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	6.4E-13	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	1.1E-13	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	2.9E-13	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	2.9E-08	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	2.3E-08	mg/kg-day	NA	--	--
	(Total)										1.3E-12
										Total Risk Across All Exposure Routes/Pathways	1.3E-12

NOTES:

EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.

mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.3.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: On-Site Workers
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	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	2.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.8E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	2.4E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.8E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	4.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.1E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	4.0E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	2.9E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	3.6E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	2.6E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	6.5E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	4.7E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	1.6E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.2E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	1.7E-03	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	1.3E-03	mg/kg-day	NA	--	--
	(Total)										2.9E-07
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	4.2E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.1E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	4.2E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.1E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	7.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	5.3E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	6.9E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	5.0E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	6.2E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	4.5E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.1E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	8.1E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	2.8E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.0E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	2.2E-04	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	1.8E-04	mg/kg-day	NA	--	--
	(Total)										5.0E-07
										Total Risk Across All Exposure Routes/Pathways	7.9E-07

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.3.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: On-Site Workers
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
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.5E-12	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	2.5E-12	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	7.6E-12
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	4.3E-12	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	4.0E-12	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	3.6E-12	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	6.5E-13	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	1.6E-12	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	1.7E-07	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.3E-07	mg/kg-day	NA	--	--
	(Total)										7.6E-12
										Total Risk Across All Exposure Routes/Pathways	7.6E-12

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.4.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Residents
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	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	6.6E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.8E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	6.6E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	4.8E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.1E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	8.3E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.1E-07	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	7.8E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	9.7E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	7.1E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.7E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.3E-07
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	4.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.2E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	4.4E-03	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	3.6E-03	mg/kg-day	NA	--	--
	(Total)										7.8E-07
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	3.4E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.5E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	3.4E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	2.5E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	5.9E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.3E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	5.6E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	4.1E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	5.0E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	3.7E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	9.0E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	6.6E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	2.3E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.7E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	1.8E-04	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	1.4E-04	mg/kg-day	NA	--	--
	(Total)										4.0E-07
										Total Risk Across All Exposure Routes/Pathways	1.2E-06

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.4.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
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
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	9.9E-12	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	9.9E-12	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	3.1E-11
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	1.7E-11	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	1.6E-11	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	1.5E-11	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	2.6E-12	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	6.6E-12	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	6.7E-07	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	5.4E-07	mg/kg-day	NA	--	--
	(Total)										3.1E-11
										Total Risk Across All Exposure Routes/Pathways	3.1E-11

NOTES:

EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.

mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.4.2 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Residents
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	Iron (Total)	7,359	mg/kg	7,359	mg/kg	M	3.5E-03	mg/kg-day	NA	--	--
											--
Dermal	Iron (Total)	7,359	mg/kg	7,359	mg/kg	M	1.4E-04	mg/kg-day	NA	--	--
											--
										Total Risk Across All Exposure Routes/Pathways	--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.4.2a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
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
Inhalation	Iron (Total)	7,359	mg/kg	5.57E-06	mg/m^3	R	5.2E-07	mg/kg-day	NA	--	--
											--
										Total Risk Across All Exposure Routes/Pathways	--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.5.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.5E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.1E-07
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.5E-07	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-06
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.7E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.9E-07
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	2.5E-07	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	1.8E-08
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.3E-07	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	1.7E-09
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	4.1E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.0E-07
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	1.0E-07	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.4E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	1.0E-02	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	8.3E-03	mg/kg-day	NA	--	--
	(Total)										1.8E-06
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	5.6E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.1E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	5.6E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	4.1E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	9.7E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.1E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	9.1E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	6.7E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	8.3E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	6.0E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-07
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	3.7E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.7E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	2.9E-04	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	2.3E-04	mg/kg-day	NA	--	--
	(Total)										6.6E-07
										Total Risk Across All Exposure Routes/Pathways	2.5E-06

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.5.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	1.2E-11	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	1.2E-11	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	3.6E-11
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	2.0E-11	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	1.9E-11	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	1.7E-11	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	3.1E-12	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	7.7E-12	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	7.8E-07	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	6.3E-07	mg/kg-day	NA	--	--
	(Total)										3.6E-11
										Total Risk Across All Exposure Routes/Pathways	3.6E-11

NOTES:

EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.

mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.5.2 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Iron (Total)	7,359	mg/kg	7,359	mg/kg	M	8.1E-03	mg/kg-day	NA	--	--
											--
Dermal	Iron (Total)	7,359	mg/kg	7,359	mg/kg	M	2.3E-04	mg/kg-day	NA	--	--
											--
										Total Risk Across All Exposure Routes/Pathways	--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.5.2a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Residents
Receptor Age: Young Child

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Inhalation	Iron (Total)	7,359	mg/kg	5.57E-06	mg/m^3	R	6.1E-07	mg/kg-day	NA	--	--
											--
										Total Risk Across All Exposure Routes/Pathways	--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.6.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Industrial / Commercial Workers
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	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	4.9E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	3.6E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	4.9E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.6E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	8.5E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	6.2E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	8.0E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	5.8E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	7.2E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	5.3E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	1.3E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	9.4E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	3.2E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.4E-08
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	3.3E-03	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	2.7E-03	mg/kg-day	NA	--	--
	(Total)										5.8E-07
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.5E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.1E-08
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.5E-08	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.1E-07
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.6E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.9E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	2.4E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	1.8E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.2E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	1.6E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	3.9E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	2.8E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	9.8E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	7.1E-09
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	7.6E-05	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	6.1E-05	mg/kg-day	NA	--	--
	(Total)										1.7E-07
										Total Risk Across All Exposure Routes/Pathways	7.5E-07

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.6.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Industrial / Commercial Workers
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
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	3.3E-12	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	3.3E-12	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	1.0E-11
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	5.7E-12	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	5.3E-12	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	4.8E-12	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	8.6E-13	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	2.2E-12	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	2.2E-07	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.8E-07	mg/kg-day	NA	--	--
	(Total)										1.0E-11
										Total Risk Across All Exposure Routes/Pathways	1.0E-11

NOTES:

EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.

mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.7.1 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Surface Soil
Receptor Population: Construction Workers
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	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	9.4E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	6.9E-09
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	9.4E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	6.9E-08
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	1.6E-08	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.2E-08
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	1.5E-08	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	1.1E-09
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	1.4E-08	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	1.0E-10
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	2.5E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.8E-08
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	6.2E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	4.6E-09
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	6.4E-04	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	5.1E-04	mg/kg-day	NA	--	--
	(Total)										1.1E-07
Dermal	Benzo(a)anthracene	0.14	mg/kg	0.14	mg/kg	M	1.7E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	1.2E-09
	Benzo(a)pyrene	0.14	mg/kg	0.14	mg/kg	M	1.7E-09	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	1.2E-08
	Benzo(b)fluoranthene	0.243	mg/kg	0.243	mg/kg	M	2.9E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	2.1E-09
	Benzo(k)fluoranthene	0.229	mg/kg	0.229	mg/kg	M	2.7E-09	mg/kg-day	7.3E-02	(mg/kg-day) $^{-1}$	2.0E-10
	Chrysene	0.207	mg/kg	0.207	mg/kg	M	2.5E-09	mg/kg-day	7.3E-03	(mg/kg-day) $^{-1}$	1.8E-11
	Dibenz(a,h)anthracene	0.037	mg/kg	0.037	mg/kg	M	4.4E-10	mg/kg-day	7.3E+00	(mg/kg-day) $^{-1}$	3.2E-09
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	0.093	mg/kg	M	1.1E-09	mg/kg-day	7.3E-01	(mg/kg-day) $^{-1}$	8.1E-10
	Aluminum	9,472	mg/kg	9,472	mg/kg	M	8.7E-06	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	7,589	mg/kg	M	7.0E-06	mg/kg-day	NA	--	--
	(Total)										2.0E-08
										Total Risk Across All Exposure Routes/Pathways	1.3E-07

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.7.1a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Construction Workers
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
Inhalation	Benzo(a)anthracene	0.14	mg/kg	1.06E-10	mg/m^3	R	3.0E-13	mg/kg-day	NA	--	--
	Benzo(a)pyrene	0.14	mg/kg	1.06E-10	mg/m^3	R	3.0E-13	mg/kg-day	3.1E+00	$(mg/kg\text{-}day)^{-1}$	9.2E-13
	Benzo(b)fluoranthene	0.243	mg/kg	1.84E-10	mg/m^3	R	5.2E-13	mg/kg-day	NA	--	--
	Benzo(k)fluoranthene	0.229	mg/kg	1.73E-10	mg/m^3	R	4.8E-13	mg/kg-day	NA	--	--
	Chrysene	0.207	mg/kg	1.57E-10	mg/m^3	R	4.4E-13	mg/kg-day	NA	--	--
	Dibenz(a,h)anthracene	0.037	mg/kg	2.80E-11	mg/m^3	R	7.8E-14	mg/kg-day	NA	--	--
	Indeno(1,2,3-cd)pyrene	0.093	mg/kg	7.05E-11	mg/m^3	R	2.0E-13	mg/kg-day	NA	--	--
	Aluminum	9,472	mg/kg	7.18E-06	mg/m^3	R	2.0E-08	mg/kg-day	NA	--	--
	Iron	7,589	mg/kg	5.75E-06	mg/m^3	R	1.6E-08	mg/kg-day	NA	--	--
	(Total)										9.2E-13
										Total Risk Across All Exposure Routes/Pathways	9.2E-13

NOTES:

EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.

mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 8.7.2 RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Subsurface Soil
Exposure Point: Subsurface Soil
Receptor Population: Construction Workers
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	Iron (Total)	7,359	mg/kg	7,359	mg/kg	M	4.9E-04	mg/kg-day	NA	--	--
											--
Dermal	Iron (Total)	7,359	mg/kg	7,359	mg/kg	M	6.8E-06	mg/kg-day	NA	--	--
											--
										Total Risk Across All Exposure Routes/Pathways	--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/kg-day - milligram per kilogram per day
(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 8.7.2a RME
CALCULATION OF CANCER RISKS
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Medium: Subsurface Soil
Exposure Medium: Air
Exposure Point: Fugative dust
Receptor Population: Construction Workers
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
Inhalation	Iron (Total)	7,359	mg/kg	5.57E-06	mg/m^3	R	1.6E-08	mg/kg-day	NA	--	--
											--
										Total Risk Across All Exposure Routes/Pathways	--

NOTES:
EPC - Exposure Point Concentration
NA - Toxicity criterion not available.
-- - Not applicable.
mg/kg - milligram per kilogram
mg/m^3 - milligram per cubic meter
mg/kg-day - milligram per kilogram per day

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

TABLE 9.1.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Receptor Population: Trespassers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			Benzo(a)anthracene	7.1E-09	--	3.7E-09	1.1E-08	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	7.1E-08	2.3E-12	3.7E-08	1.1E-07	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	1.2E-08	--	6.4E-09	1.9E-08	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	1.2E-09	--	6.0E-10	1.8E-09	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	1.1E-10	--	5.5E-11	1.6E-10	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	1.9E-08	--	9.8E-09	2.9E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4.7E-09	--	2.5E-09	7.2E-09	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	1.9E-03	1.5E-04	7.7E-05	2.2E-03
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	5.1E-03	--	2.1E-04	5.4E-03
			(Total)	1.2E-07	2.3E-12	6.0E-08	1.8E-07	(Total)		7.1E-03	1.5E-04	2.8E-04	7.5E-03

Notes:

Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil	1.8E-07
Total Risk Across All Media and All Exposure Routes	1.8E-07

All Exposure Routes:

Total Central Nervous System HI =	0.00

Total Hazard Index Across Surface Soil	0.01
Total Hazard Index Across All Media and All Exposure Routes	0.01

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.01
Oral / Dermal Cardiovascular System HI =	0.01
Oral / Dermal Liver HI =	0.01

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Receptor Population: Trespassers
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
Surface Soil	Surface Soil	Surface Soil											
			Benzo(a)anthracene	4.2E-09	--	5.7E-09	9.9E-09	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	4.2E-08	1.3E-12	5.7E-08	9.9E-08	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	7.2E-09	--	1.0E-08	1.7E-08	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	6.8E-10	--	9.4E-10	1.6E-09	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	6.2E-11	--	8.5E-11	1.5E-10	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	1.1E-08	--	1.5E-08	2.6E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.8E-09	--	3.8E-09	6.6E-09	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	3.0E-03	2.3E-04	3.2E-04	3.5E-03
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	8.0E-03	--	8.5E-04	8.9E-03
			(Total)	6.7E-08	1.3E-12	9.3E-08	1.6E-07	(Total)		1.1E-02	2.3E-04	1.2E-03	1.2E-02

Notes:
Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil: 1.6E-07
Total Risk Across All Media and All Exposure Routes: 1.6E-07

All Exposure Routes:
Total Central Nervous System HI = **0.00**

Total Hazard Index Across Surface Soil: 0.01
Total Hazard Index Across All Media and All Exposure Routes: 0.01

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = 0.01
Oral / Dermal Cardiovascular System HI = 0.01
Oral / Dermal Liver HI = 0.01

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Current
Receptor Population: On-Site Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			Benzo(a)anthracene	1.8E-08	--	3.1E-08	4.9E-08	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	1.8E-07	7.6E-12	3.1E-07	4.9E-07	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	3.1E-08	--	5.3E-08	8.4E-08	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	2.9E-09	--	5.0E-09	7.9E-09	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	2.6E-10	--	4.5E-10	7.2E-10	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	4.7E-08	--	8.1E-08	1.3E-07	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	1.2E-08	--	2.0E-08	3.2E-08	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	4.6E-03	4.7E-04	6.1E-04	5.7E-03
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	1.2E-02	--	1.6E-03	1.4E-02
			(Total)	2.9E-07	7.6E-12	5.0E-07	7.9E-07	(Total)		1.7E-02	4.7E-04	2.2E-03	2.0E-02

Notes:

Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil: 7.9E-07
Total Risk Across All Media and All Exposure Routes: 7.9E-07

All Exposure Routes:
Total Central Nervous System HI = 0.01

Total Hazard Index Across Surface Soil: 0.02
Total Hazard Index Across All Media and All Exposure Routes: 0.02

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = 0.01
Oral / Dermal Cardiovascular System HI = 0.01
Oral / Dermal Liver HI = 0.01

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			Benzo(a)anthracene	4.8E-08	--	2.5E-08	7.3E-08	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	4.8E-07	3.1E-11	2.5E-07	7.3E-07	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	8.3E-08	--	4.3E-08	1.3E-07	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	7.8E-09	--	4.1E-09	1.2E-08	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	7.1E-10	--	3.7E-10	1.1E-09	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	1.3E-07	--	6.6E-08	1.9E-07	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	3.2E-08	--	1.7E-08	4.8E-08	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	1.3E-02	2.0E-03	5.2E-04	1.5E-02
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	3.5E-02	--	1.4E-03	3.6E-02
			(Total)	7.8E-07	3.1E-11	4.0E-07	1.2E-06	(Total)		4.8E-02	2.0E-03	1.9E-03	5.1E-02
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	3.4E-02	--	1.3E-03	3.5E-02
			(Total)	--	--	--	--	(Total)		3.4E-02	--	1.3E-03	3.5E-02

Notes:
Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil	1.2E-06
Total Risk Across Subsurface Soil	--
Total Risk Across All Media and All Exposure Routes	1.2E-06

All Exposure Routes:

Total Central Nervous System HI =	0.02

Total Hazard Index Across Surface Soil	0.05
Total Hazard Index Across Subsurface Soil	0.03
Total Hazard Index Across All Media and All Exposure Routes	0.09

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.07
Oral / Dermal Cardiovascular System HI =	0.07
Oral / Dermal Liver HI =	0.07

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Residents
Receptor Age: Young Child

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			Benzo(a)anthracene	1.1E-07	--	4.1E-08	1.5E-07	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	1.1E-06	3.6E-11	4.1E-07	1.5E-06	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	1.9E-07	--	7.1E-08	2.7E-07	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	1.8E-08	--	6.7E-09	2.5E-08	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	1.7E-09	--	6.0E-10	2.3E-09	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	3.0E-07	--	1.1E-07	4.0E-07	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	7.4E-08	--	2.7E-08	1.0E-07	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	1.2E-01	9.1E-03	3.4E-03	1.3E-01
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	3.2E-01	--	9.1E-03	3.3E-01
			(Total)	1.8E-06	3.6E-11	6.6E-07	2.5E-06	(Total)		4.4E-01	9.1E-03	1.2E-02	4.7E-01
Subsurface Soil	Subsurface Soil	Subsurface Soil											
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	3.1E-01	--	8.8E-03	3.2E-01
			(Total)	--	--	--	--	(Total)		3.1E-01	--	8.8E-03	3.2E-01

Notes:
Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil	2.5E-06
Total Risk Across Subsurface Soil	--
Total Risk Across All Media and All Exposure Routes	2.5E-06

All Exposure Routes:

Total Central Nervous System HI =	**0.13**

Total Hazard Index Across Surface Soil	0.47
Total Hazard Index Across Subsurface Soil	0.32
Total Hazard Index Across All Media and All Exposure Routes	0.79

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.65
Oral / Dermal Cardiovascular System HI =	0.65
Oral / Dermal Liver HI =	0.65

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

Scenario Timeframe: Future
Receptor Population: Industrial / Commercial Workers
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil											
			Benzo(a)anthracene	3.6E-08	--	1.1E-08	4.6E-08	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	3.6E-07	1.0E-11	1.1E-07	4.6E-07	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	6.2E-08	--	1.9E-08	8.1E-08	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	5.8E-09	--	1.8E-09	7.6E-09	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	5.3E-10	--	1.6E-10	6.9E-10	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	9.4E-08	--	2.8E-08	1.2E-07	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	2.4E-08	--	7.1E-09	3.1E-08	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	9.3E-03	6.2E-04	2.1E-04	1.0E-02
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	2.5E-02	--	5.7E-04	2.5E-02
			(Total)	5.8E-07	1.0E-11	1.7E-07	7.5E-07	(Total)		3.4E-02	6.2E-04	7.9E-04	3.5E-02

Notes:
Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil: 7.5E-07
Total Risk Across All Media and All Exposure Routes: 7.5E-07

All Exposure Routes:
Total Central Nervous System HI = 0.01

Total Hazard Index Across Surface Soil: 0.04
Total Hazard Index Across All Media and All Exposure Routes: 0.04

Oral and Dermal Exposure Routes:
Oral / Dermal Gastrointestinal System HI = 0.03
Oral / Dermal Cardiovascular System HI = 0.03
Oral / Dermal Liver HI = 0.03

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN
YORKTOWN, VIRGINIA

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

Medium	Exposure Medium	Exposure Point	Chemical	Carcinogenic Risk				Chemical	Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total		Primary Target Organ	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil	Benzo(a)anthracene	6.9E-09	--	1.2E-09	8.1E-09	Benzo(a)anthracene	NA	--	--	--	--
			Benzo(a)pyrene	6.9E-08	9.2E-13	1.2E-08	8.1E-08	Benzo(a)pyrene	NA	--	--	--	--
			Benzo(b)fluoranthene	1.2E-08	--	2.1E-09	1.4E-08	Benzo(b)fluoranthene	NA	--	--	--	--
			Benzo(k)fluoranthene	1.1E-09	--	2.0E-10	1.3E-09	Benzo(k)fluoranthene	NA	--	--	--	--
			Chrysene	1.0E-10	--	1.8E-11	1.2E-10	Chrysene	NA	--	--	--	--
			Dibenz(a,h)anthracene	1.8E-08	--	3.2E-09	2.1E-08	Dibenz(a,h)anthracene	NA	--	--	--	--
			Indeno(1,2,3-cd)pyrene	4.6E-09	--	8.1E-10	5.4E-09	Indeno(1,2,3-cd)pyrene	NA	--	--	--	--
			Aluminum	--	--	--	--	Aluminum	CNS	4.4E-02	1.4E-03	6.1E-04	4.7E-02
			Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	1.2E-01	--	1.6E-03	1.2E-01
			(Total)	1.1E-07	9.2E-13	2.0E-08	1.3E-07	(Total)		1.6E-01	1.4E-03	2.2E-03	1.7E-01
Subsurface Soil	Subsurface Soil	Subsurface Soil	Iron	--	--	--	--	Iron	(o) Liver / CVS / GIS	1.2E-01	--	1.6E-03	1.2E-01
			(Total)	--	--	--	--	(Total)		1.2E-01	--	1.6E-03	1.2E-01

Notes:
Target Organ Abbreviations:
CNS = Central Nervous System
CVS = Cardiovascular System
GIS = Gastrointestinal System

(o) Oral exposure
(i) Inhalation exposure

Total Risk Across Surface Soil	1.3E-07
Total Risk Across Subsurface Soil	--
Total Risk Across All Media and All Exposure Routes	1.3E-07

All Exposure Routes:

Total Central Nervous System HI =	0.05

Total Hazard Index Across Surface Soil	0.17
Total Hazard Index Across Subsurface Soil	0.12
Total Hazard Index Across All Media and All Exposure Routes	0.28

Oral and Dermal Exposure Routes:

Oral / Dermal Gastrointestinal System HI =	0.24
Oral / Dermal Cardiovascular System HI =	0.24
Oral / Dermal Liver HI =	0.24

ATTACHMENT D

HUMAN HEALTH RISK CALCULCATION SPREADSHEETS

ADULT AND ADOLESCENT TRESPASSERS - CURRENT SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	Adult	Adolescent	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	100	100	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	52	52	
ED	years	Exposure duration	24	9	
BW	kg	Body weight	70	45	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	3,285	

				Adult						Adolescent					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	7.3E-01	NA	9.8E-09	7.1E-09	6.2%	2.8E-08	--	--	5.7E-09	4.2E-09	6.2%	4.4E-08	--	--
Benzo(a)pyrene	0.14	7.3E+00	NA	9.8E-09	7.1E-08	61.6%	2.8E-08	--	--	5.7E-09	4.2E-08	61.6%	4.4E-08	--	--
Benzo(b)fluoranthene	0.243	7.3E-01	NA	1.7E-08	1.2E-08	10.7%	5.0E-08	--	--	9.9E-09	7.2E-09	10.7%	7.7E-08	--	--
Benzo(k)fluoranthene	0.229	7.3E-02	NA	1.6E-08	1.2E-09	1.0%	4.7E-08	--	--	9.3E-09	6.8E-10	1.0%	7.2E-08	--	--
Chrysene	0.207	7.3E-03	NA	1.4E-08	1.1E-10	0.1%	4.2E-08	--	--	8.4E-09	6.2E-11	0.1%	6.6E-08	--	--
Dibenz(a,h)anthracene	0.037	7.3E+00	NA	2.6E-09	1.9E-08	16.3%	7.5E-09	--	--	1.5E-09	1.1E-08	16.3%	1.2E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.3E-01	NA	6.5E-09	4.7E-09	4.1%	1.9E-08	--	--	3.8E-09	2.8E-09	4.1%	2.9E-08	--	--
Aluminum	9,472	NA	1.0E+00	6.6E-04	--	--	1.9E-03	1.9E-03	27.2%	3.9E-04	--	--	3.0E-03	3.0E-03	27.2%
Iron	7,589	NA	3.0E-01	5.3E-04	--	--	1.5E-03	5.1E-03	72.8%	3.1E-04	--	--	2.4E-03	8.0E-03	72.8%
				Total ILCR:	1.2E-07	100.0%	Total HI:	7.1E-03	100.0%	Total ILCR:	6.7E-08	100.0%	Total HI:	1.1E-02	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND ADOLESCENT TRESPASSERS - CURRENT SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	Adult	Adolescent	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,700	5,300	
EF	days/year	Exposure frequency	52	52	
ED	years	Exposure duration	24	9	
BW	kg	Body weight	70	45	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	3,285	

					Adult						Adolescent					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	0.13	7.3E-01	NA	5.1E-09	3.7E-09	6.2%	1.5E-08	--	--	7.9E-09	5.7E-09	6.2%	6.1E-08	--	--
Benzo(a)pyrene	0.14	0.13	7.3E+00	NA	5.1E-09	3.7E-08	61.6%	1.5E-08	--	--	7.9E-09	5.7E-08	61.6%	6.1E-08	--	--
Benzo(b)fluoranthene	0.243	0.13	7.3E-01	NA	8.8E-09	6.4E-09	10.7%	2.6E-08	--	--	1.4E-08	1.0E-08	10.7%	1.1E-07	--	--
Benzo(k)fluoranthene	0.229	0.13	7.3E-02	NA	8.3E-09	6.0E-10	1.0%	2.4E-08	--	--	1.3E-08	9.4E-10	1.0%	1.0E-07	--	--
Chrysene	0.207	0.13	7.3E-03	NA	7.5E-09	5.5E-11	0.1%	2.2E-08	--	--	1.2E-08	8.5E-11	0.1%	9.0E-08	--	--
Dibenz(a,h)anthracene	0.037	0.13	7.3E+00	NA	1.3E-09	9.8E-09	16.3%	3.9E-09	--	--	2.1E-09	1.5E-08	16.3%	1.6E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	0.13	7.3E-01	NA	3.4E-09	2.5E-09	4.1%	9.8E-09	--	--	5.2E-09	3.8E-09	4.1%	4.1E-08	--	--
Aluminum	9,472	0.01	NA	1.0E+00	2.6E-05	--	--	7.7E-05	7.7E-05	27.2%	4.1E-05	--	--	3.2E-04	3.2E-04	27.2%
Iron	7,589	0.01	NA	3.0E-01	2.1E-05	--	--	6.2E-05	2.1E-04	72.8%	3.3E-05	--	--	2.5E-04	8.5E-04	72.8%
					Total ILCR:	6.0E-08	100.0%	Total HI:	2.8E-04	100.0%	Total ILCR:	9.3E-08	100.0%	Total HI:	1.2E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND ADOLESCENT TRESPASSERS - CURRENT SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Adolescent	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	0.83	0.83	
ET	hours/day	Exposure time	12	12	
EF	days/year	Exposure frequency	52	52	
ED	years	Exposure duration	24	9	
BW	kg	Body weight	70	45	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	3,285	

					Adult						Adolescent					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	1.06E-10	NA	NA	7.4E-13	--	--	2.1E-12	--	--	4.3E-13	--	--	3.3E-12	--	--
Benzo(a)pyrene	0.14	1.06E-10	3.1E+00	NA	7.4E-13	2.3E-12	100.0%	2.1E-12	--	--	4.3E-13	1.3E-12	100.0%	3.3E-12	--	--
Benzo(b)fluoranthene	0.243	1.84E-10	NA	NA	1.3E-12	--	--	3.7E-12	--	--	7.5E-13	--	--	5.8E-12	--	--
Benzo(k)fluoranthene	0.229	1.73E-10	NA	NA	1.2E-12	--	--	3.5E-12	--	--	7.0E-13	--	--	5.5E-12	--	--
Chrysene	0.207	1.57E-10	NA	NA	1.1E-12	--	--	3.2E-12	--	--	6.4E-13	--	--	5.0E-12	--	--
Dibenz(a,h)anthracene	0.037	2.80E-11	NA	NA	1.9E-13	--	--	5.7E-13	--	--	1.1E-13	--	--	8.8E-13	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.05E-11	NA	NA	4.9E-13	--	--	1.4E-12	--	--	2.9E-13	--	--	2.2E-12	--	--
Aluminum	9,472	7.18E-06	NA	1.0E-03	5.0E-08	--	--	1.5E-07	1.5E-04	100.0%	2.9E-08	--	--	2.3E-07	2.3E-04	100.0%
Iron	7,589	5.75E-06	NA	NA	4.0E-08	--	--	1.2E-07	--	--	2.3E-08	--	--	1.8E-07	--	--
					Total ILCR:	2.3E-12	100.0%	Total HI:	1.5E-04	100.0%	Total ILCR:	1.3E-12	100.0%	Total HI:	2.3E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT ON-SITE WORKERS - CURRENT SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	On-Site Worker	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	50	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	7.3E-01	NA	2.4E-08	1.8E-08	6.2%	6.8E-08	--	--
Benzo(a)pyrene	0.14	7.3E+00	NA	2.4E-08	1.8E-07	61.6%	6.8E-08	--	--
Benzo(b)fluoranthene	0.243	7.3E-01	NA	4.3E-08	3.1E-08	10.7%	1.2E-07	--	--
Benzo(k)fluoranthene	0.229	7.3E-02	NA	4.0E-08	2.9E-09	1.0%	1.1E-07	--	--
Chrysene	0.207	7.3E-03	NA	3.6E-08	2.6E-10	0.1%	1.0E-07	--	--
Dibenz(a,h)anthracene	0.037	7.3E+00	NA	6.5E-09	4.7E-08	16.3%	1.8E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.3E-01	NA	1.6E-08	1.2E-08	4.1%	4.5E-08	--	--
Aluminum	9,472	NA	1.0E+00	1.7E-03	--	--	4.6E-03	4.6E-03	27.2%
Iron	7,589	NA	3.0E-01	1.3E-03	--	--	3.7E-03	1.2E-02	72.8%
				Total ILCR:	2.9E-07	100.0%	Total HI:	1.7E-02	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT ON-SITE WORKERS - CURRENT SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	On-Site Worker	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	0.13	7.3E-01	NA	4.2E-08	3.1E-08	6.2%	1.2E-07	--	--
Benzo(a)pyrene	0.14	0.13	7.3E+00	NA	4.2E-08	3.1E-07	61.6%	1.2E-07	--	--
Benzo(b)fluoranthene	0.243	0.13	7.3E-01	NA	7.3E-08	5.3E-08	10.7%	2.0E-07	--	--
Benzo(k)fluoranthene	0.229	0.13	7.3E-02	NA	6.9E-08	5.0E-09	1.0%	1.9E-07	--	--
Chrysene	0.207	0.13	7.3E-03	NA	6.2E-08	4.5E-10	0.1%	1.7E-07	--	--
Dibenz(a,h)anthracene	0.037	0.13	7.3E+00	NA	1.1E-08	8.1E-08	16.3%	3.1E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	0.13	7.3E-01	NA	2.8E-08	2.0E-08	4.1%	7.8E-08	--	--
Aluminum	9,472	0.01	NA	1.0E+00	2.2E-04	--	--	6.1E-04	6.1E-04	27.2%
Iron	7,589	0.01	NA	3.0E-01	1.8E-04	--	--	4.9E-04	1.6E-03	72.8%
					Total ILCR:	5.0E-07	100.0%	Total HI:	2.2E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT ON-SITE WORKERS - CURRENT SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	On-Site Worker	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	0.83	
ET	hours/day	Exposure time	8	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	1.06E-10	NA	NA	2.5E-12	--	--	6.9E-12	--	--
Benzo(a)pyrene	0.14	1.06E-10	3.1E+00	NA	2.5E-12	7.6E-12	100.0%	6.9E-12	--	--
Benzo(b)fluoranthene	0.243	1.84E-10	NA	NA	4.3E-12	--	--	1.2E-11	--	--
Benzo(k)fluoranthene	0.229	1.73E-10	NA	NA	4.0E-12	--	--	1.1E-11	--	--
Chrysene	0.207	1.57E-10	NA	NA	3.6E-12	--	--	1.0E-11	--	--
Dibenz(a,h)anthracene	0.037	2.80E-11	NA	NA	6.5E-13	--	--	1.8E-12	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.05E-11	NA	NA	1.6E-12	--	--	4.6E-12	--	--
Aluminum	9,472	7.18E-06	NA	1.0E-03	1.7E-07	--	--	4.7E-07	4.7E-04	100.0%
Iron	7,589	5.75E-06	NA	NA	1.3E-07	--	--	3.7E-07	--	--
					Total ILCR:	7.6E-12	100.0%	Total HI:	4.7E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	100	200	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	7.3E-01	NA	6.6E-08	4.8E-08	6.2%	1.9E-07	--	--	1.5E-07	1.1E-07	6.2%	1.8E-06	--	--
Benzo(a)pyrene	0.14	7.3E+00	NA	6.6E-08	4.8E-07	61.6%	1.9E-07	--	--	1.5E-07	1.1E-06	61.6%	1.8E-06	--	--
Benzo(b)fluoranthene	0.243	7.3E-01	NA	1.1E-07	8.3E-08	10.7%	3.3E-07	--	--	2.7E-07	1.9E-07	10.7%	3.1E-06	--	--
Benzo(k)fluoranthene	0.229	7.3E-02	NA	1.1E-07	7.8E-09	1.0%	3.1E-07	--	--	2.5E-07	1.8E-08	1.0%	2.9E-06	--	--
Chrysene	0.207	7.3E-03	NA	9.7E-08	7.1E-10	0.1%	2.8E-07	--	--	2.3E-07	1.7E-09	0.1%	2.6E-06	--	--
Dibenz(a,h)anthracene	0.037	7.3E+00	NA	1.7E-08	1.3E-07	16.3%	5.1E-08	--	--	4.1E-08	3.0E-07	16.3%	4.7E-07	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.3E-01	NA	4.4E-08	3.2E-08	4.1%	1.3E-07	--	--	1.0E-07	7.4E-08	4.1%	1.2E-06	--	--
Aluminum	9,472	NA	1.0E+00	4.4E-03	--	--	1.3E-02	1.3E-02	27.2%	1.0E-02	--	--	1.2E-01	1.2E-01	27.2%
Iron	7,589	NA	3.0E-01	3.6E-03	--	--	1.0E-02	3.5E-02	72.8%	8.3E-03	--	--	9.7E-02	3.2E-01	72.8%
				Total ILCR:	7.8E-07	100.0%	Total HI:	4.8E-02	100.0%	Total ILCR:	1.8E-06	100.0%	Total HI:	4.4E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,700	2,800	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	0.13	7.3E-01	NA	3.4E-08	2.5E-08	6.2%	9.9E-08	--	--	5.6E-08	4.1E-08	6.2%	6.5E-07	--	--
Benzo(a)pyrene	0.14	0.13	7.3E+00	NA	3.4E-08	2.5E-07	61.6%	9.9E-08	--	--	5.6E-08	4.1E-07	61.6%	6.5E-07	--	--
Benzo(b)fluoranthene	0.243	0.13	7.3E-01	NA	5.9E-08	4.3E-08	10.7%	1.7E-07	--	--	9.7E-08	7.1E-08	10.7%	1.1E-06	--	--
Benzo(k)fluoranthene	0.229	0.13	7.3E-02	NA	5.6E-08	4.1E-09	1.0%	1.6E-07	--	--	9.1E-08	6.7E-09	1.0%	1.1E-06	--	--
Chrysene	0.207	0.13	7.3E-03	NA	5.0E-08	3.7E-10	0.1%	1.5E-07	--	--	8.3E-08	6.0E-10	0.1%	9.6E-07	--	--
Dibenz(a,h)anthracene	0.037	0.13	7.3E+00	NA	9.0E-09	6.6E-08	16.3%	2.6E-08	--	--	1.5E-08	1.1E-07	16.3%	1.7E-07	--	--
Indeno(1,2,3-cd)pyrene	0.093	0.13	7.3E-01	NA	2.3E-08	1.7E-08	4.1%	6.6E-08	--	--	3.7E-08	2.7E-08	4.1%	4.3E-07	--	--
Aluminum	9,472	0.01	NA	1.0E+00	1.8E-04	--	--	5.2E-04	5.2E-04	27.2%	2.9E-04	--	--	3.4E-03	3.4E-03	27.2%
Iron	7,589	0.01	NA	3.0E-01	1.4E-04	--	--	4.1E-04	1.4E-03	72.8%	2.3E-04	--	--	2.7E-03	9.1E-03	72.8%
					Total ILCR:	4.0E-07	100.0%	Total HI:	1.9E-03	100.0%	Total ILCR:	6.6E-07	100.0%	Total HI:	1.2E-02	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	0.83	0.83	
ET	hours/day	Exposure time	24	24	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	1.06E-10	NA	NA	9.9E-12	--	--	2.9E-11	--	--	1.2E-11	--	--	1.4E-10	--	--
Benzo(a)pyrene	0.14	1.06E-10	3.1E+00	NA	9.9E-12	3.1E-11	100.0%	2.9E-11	--	--	1.2E-11	3.6E-11	100.0%	1.4E-10	--	--
Benzo(b)fluoranthene	0.243	1.84E-10	NA	NA	1.7E-11	--	--	5.0E-11	--	--	2.0E-11	--	--	2.3E-10	--	--
Benzo(k)fluoranthene	0.229	1.73E-10	NA	NA	1.6E-11	--	--	4.7E-11	--	--	1.9E-11	--	--	2.2E-10	--	--
Chrysene	0.207	1.57E-10	NA	NA	1.5E-11	--	--	4.3E-11	--	--	1.7E-11	--	--	2.0E-10	--	--
Dibenz(a,h)anthracene	0.037	2.80E-11	NA	NA	2.6E-12	--	--	7.6E-12	--	--	3.1E-12	--	--	3.6E-11	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.05E-11	NA	NA	6.6E-12	--	--	1.9E-11	--	--	7.7E-12	--	--	9.0E-11	--	--
Aluminum	9,472	7.18E-06	NA	1.0E-03	6.7E-07	--	--	2.0E-06	2.0E-03	100.0%	7.8E-07	--	--	9.1E-06	9.1E-03	100.0%
Iron	7,589	5.75E-06	NA	NA	5.4E-07	--	--	1.6E-06	--	--	6.3E-07	--	--	7.3E-06	--	--
					Total ILCR:	3.1E-11	100.0%	Total HI:	2.0E-03	100.0%	Total ILCR:	3.6E-11	100.0%	Total HI:	9.1E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDo	mg/kg/d	Oral reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
IR-S	mg/day	Ingestion rate of soil	100	200	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	1	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

				Adult						Young Child					
				Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Iron	7,359	NA	3.0E-01	3.5E-03	--	--	1.0E-02	3.4E-02	100.0%	8.1E-03	--	--	9.4E-02	3.1E-01	100.0%
				Total ILCR:	--	--	Total HI:	3.4E-02	100.0%	Total ILCR:	--	--	Total HI:	3.1E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
DERMAL CONTACT WITH SUBSURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	Adult	Young Child	
DAD	mg/kg/d	Dermally absorbed dose	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
CF	kg/mg	Conversion factor	1.00E-06	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	0.2	
ABS	NA	Absorption fraction	CS	CS	
SA	cm2/day	Skin surface area available for contact	5,700	2,800	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Iron	7,359	0.01	NA	3.0E-01	1.4E-04	--	--	4.0E-04	1.3E-03	100.0%	2.3E-04	--	--	2.6E-03	8.8E-03	100.0%
					Total ILCR:	--	--	Total HI:	1.3E-03	100.0%	Total ILCR:	--	--	Total HI:	8.8E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT AND YOUNG CHILD RESIDENTS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SUBSURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Adult	Young Child	
CDI	mg/kg/d	Chronic daily intake	CS	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	CS	
HQ	NA	Hazard quotient	CS	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	CS	
C	mg/kg	Concentration of chemical in soil	CS	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	1.32E+09	
RR	m3/hour	Respiration rate	0.83	0.83	
ET	hours/day	Exposure time	24	24	
EF	days/year	Exposure frequency	350	350	
ED	years	Exposure duration	24	6	
BW	kg	Body weight	70	15	
AT-C	days	Averaging time, carcinogens	25,550	25,550	
AT-N	days	Averaging time, noncarcinogens	8,760	2,190	

					Adult						Young Child					
					Carcinogens			Noncarcinogens			Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Iron	7,359	5.57E-06	NA	NA	5.2E-07	--	--	1.5E-06	--	--	6.1E-07	--	--	7.1E-06	--	--
					Total ILCR:	--	--	Total HI:	--	--	Total ILCR:	--	--	Total HI:	--	--

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT INDUSTRIAL / COMMERCIAL WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	Industrial / Commercial Worker	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	100	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	7.3E-01	NA	4.9E-08	3.6E-08	6.2%	1.4E-07	--	--
Benzo(a)pyrene	0.14	7.3E+00	NA	4.9E-08	3.6E-07	61.6%	1.4E-07	--	--
Benzo(b)fluoranthene	0.243	7.3E-01	NA	8.5E-08	6.2E-08	10.7%	2.4E-07	--	--
Benzo(k)fluoranthene	0.229	7.3E-02	NA	8.0E-08	5.8E-09	1.0%	2.2E-07	--	--
Chrysene	0.207	7.3E-03	NA	7.2E-08	5.3E-10	0.1%	2.0E-07	--	--
Dibenz(a,h)anthracene	0.037	7.3E+00	NA	1.3E-08	9.4E-08	16.3%	3.6E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.3E-01	NA	3.2E-08	2.4E-08	4.1%	9.1E-08	--	--
Aluminum	9,472	NA	1.0E+00	3.3E-03	--	--	9.3E-03	9.3E-03	27.2%
Iron	7,589	NA	3.0E-01	2.7E-03	--	--	7.4E-03	2.5E-02	72.8%
				Total ILCR:	5.8E-07	100.0%	Total HI:	3.4E-02	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT INDUSTRIAL / COMMERCIAL WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	Industrial / Commercial Worker	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.07	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	0.13	7.3E-01	NA	1.5E-08	1.1E-08	6.2%	4.1E-08	--	--
Benzo(a)pyrene	0.14	0.13	7.3E+00	NA	1.5E-08	1.1E-07	61.6%	4.1E-08	--	--
Benzo(b)fluoranthene	0.243	0.13	7.3E-01	NA	2.6E-08	1.9E-08	10.7%	7.2E-08	--	--
Benzo(k)fluoranthene	0.229	0.13	7.3E-02	NA	2.4E-08	1.8E-09	1.0%	6.7E-08	--	--
Chrysene	0.207	0.13	7.3E-03	NA	2.2E-08	1.6E-10	0.1%	6.1E-08	--	--
Dibenz(a,h)anthracene	0.037	0.13	7.3E+00	NA	3.9E-09	2.8E-08	16.3%	1.1E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	0.13	7.3E-01	NA	9.8E-09	7.1E-09	4.1%	2.7E-08	--	--
Aluminum	9,472	0.01	NA	1.0E+00	7.6E-05	--	--	2.1E-04	2.1E-04	27.2%
Iron	7,589	0.01	NA	3.0E-01	6.1E-05	--	--	1.7E-04	5.7E-04	72.8%
					Total ILCR:	1.7E-07	100.0%	Total HI:	7.9E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT INDUSTRIAL / COMMERCIAL WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Industrial / Commercial Worker	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	1.10	
ET	hours/day	Exposure time	8	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	25	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	9,125	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	1.06E-10	NA	NA	3.3E-12	--	--	9.1E-12	--	--
Benzo(a)pyrene	0.14	1.06E-10	3.1E+00	NA	3.3E-12	1.0E-11	100.0%	9.1E-12	--	--
Benzo(b)fluoranthene	0.243	1.84E-10	NA	NA	5.7E-12	--	--	1.6E-11	--	--
Benzo(k)fluoranthene	0.229	1.73E-10	NA	NA	5.3E-12	--	--	1.5E-11	--	--
Chrysene	0.207	1.57E-10	NA	NA	4.8E-12	--	--	1.4E-11	--	--
Dibenz(a,h)anthracene	0.037	2.80E-11	NA	NA	8.6E-13	--	--	2.4E-12	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.05E-11	NA	NA	2.2E-12	--	--	6.1E-12	--	--
Aluminum	9,472	7.18E-06	NA	1.0E-03	2.2E-07	--	--	6.2E-07	6.2E-04	100.0%
Iron	7,589	5.75E-06	NA	NA	1.8E-07	--	--	5.0E-07	--	--
					Total ILCR:	1.0E-11	100.0%	Total HI:	6.2E-04	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	Construction Workers	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	480	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	7.3E-01	NA	9.4E-09	6.9E-09	6.2%	6.6E-07	--	--
Benzo(a)pyrene	0.14	7.3E+00	NA	9.4E-09	6.9E-08	61.6%	6.6E-07	--	--
Benzo(b)fluoranthene	0.243	7.3E-01	NA	1.6E-08	1.2E-08	10.7%	1.1E-06	--	--
Benzo(k)fluoranthene	0.229	7.3E-02	NA	1.5E-08	1.1E-09	1.0%	1.1E-06	--	--
Chrysene	0.207	7.3E-03	NA	1.4E-08	1.0E-10	0.1%	9.7E-07	--	--
Dibenz(a,h)anthracene	0.037	7.3E+00	NA	2.5E-09	1.8E-08	16.3%	1.7E-07	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.3E-01	NA	6.2E-09	4.6E-09	4.1%	4.4E-07	--	--
Aluminum	9,472	NA	1.0E+00	6.4E-04	--	--	4.4E-02	4.4E-02	27.2%
Iron	7,589	NA	3.0E-01	5.1E-04	--	--	3.6E-02	1.2E-01	72.8%
				Total ILCR:	1.1E-07	100.0%	Total HI:	1.6E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	Construction Workers	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	0.13	7.3E-01	NA	1.7E-09	1.2E-09	6.2%	1.2E-07	--	--
Benzo(a)pyrene	0.14	0.13	7.3E+00	NA	1.7E-09	1.2E-08	61.6%	1.2E-07	--	--
Benzo(b)fluoranthene	0.243	0.13	7.3E-01	NA	2.9E-09	2.1E-09	10.7%	2.0E-07	--	--
Benzo(k)fluoranthene	0.229	0.13	7.3E-02	NA	2.7E-09	2.0E-10	1.0%	1.9E-07	--	--
Chrysene	0.207	0.13	7.3E-03	NA	2.5E-09	1.8E-11	0.1%	1.7E-07	--	--
Dibenz(a,h)anthracene	0.037	0.13	7.3E+00	NA	4.4E-10	3.2E-09	16.3%	3.1E-08	--	--
Indeno(1,2,3-cd)pyrene	0.093	0.13	7.3E-01	NA	1.1E-09	8.1E-10	4.1%	7.8E-08	--	--
Aluminum	9,472	0.01	NA	1.0E+00	8.7E-06	--	--	6.1E-04	6.1E-04	27.2%
Iron	7,589	0.01	NA	3.0E-01	7.0E-06	--	--	4.9E-04	1.6E-03	72.8%
					Total ILCR:	2.0E-08	100.0%	Total HI:	2.2E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM SURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Construction Workers	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	2.50	
ET	hours/day	Exposure time	8	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Benzo(a)anthracene	0.14	1.06E-10	NA	NA	3.0E-13	--	--	2.1E-11	--	--
Benzo(a)pyrene	0.14	1.06E-10	3.1E+00	NA	3.0E-13	9.2E-13	100.0%	2.1E-11	--	--
Benzo(b)fluoranthene	0.243	1.84E-10	NA	NA	5.2E-13	--	--	3.6E-11	--	--
Benzo(k)fluoranthene	0.229	1.73E-10	NA	NA	4.8E-13	--	--	3.4E-11	--	--
Chrysene	0.207	1.57E-10	NA	NA	4.4E-13	--	--	3.1E-11	--	--
Dibenz(a,h)anthracene	0.037	2.80E-11	NA	NA	7.8E-14	--	--	5.5E-12	--	--
Indeno(1,2,3-cd)pyrene	0.093	7.05E-11	NA	NA	2.0E-13	--	--	1.4E-11	--	--
Aluminum	9,472	7.18E-06	NA	1.0E-03	2.0E-08	--	--	1.4E-06	1.4E-03	100.0%
Iron	7,589	5.75E-06	NA	NA	1.6E-08	--	--	1.1E-06	--	--
					Total ILCR:	9.2E-13	100.0%	Total HI:	1.4E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
ACCIDENTAL INGESTION OF SUBSURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (C*IR*CF*FI*EF*ED)/(BW*AT)
ILCR = CDI*CSFo
HQ = CDI/RfDo

Parameter	Units	Description	Construction Workers	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFo	1/(mg/kg/d)	Oral cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDo	mg/kg/d	Oral reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
IR-S	mg/day	Ingestion rate of soil	480	
CF	kg/mg	Conversion factor	1.00E-06	
FI	NA	Fraction of soil ingested from site	1	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

				Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	CSFo 1/(mg/kg/d)	RfDo (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Iron	7,359	NA	3.0E-01	4.9E-04	--	--	3.5E-02	1.2E-01	100.0%
				Total ILCR:	--	--	Total HI:	1.2E-01	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
DERMAL CONTACT WITH SUBSURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

DAD (mg/kg/d) = (C*CF*AF*ABS*SA*EF*ED)/(BW*AT)
ILCR = CDI*CSFd
HQ = CDI/RfDd

Parameter	Units	Description	Construction Workers	
DAD	mg/kg/d	Dermally absorbed dose	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFd	1/(mg/kg/d)	Dermal cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDd	mg/kg/d	Dermal reference dose	CS	
C	mg/kg	Concentration of chemical in soil	CS	
CF	kg/mg	Conversion factor	1.00E-06	
AF	mg/cm2	Soil to skin adherence factor	0.2	
ABS	NA	Absorption fraction	CS	
SA	cm2/day	Skin surface area available for contact	3,300	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	ABS	CSFd 1/(mg/kg/d)	RfDd (mg/kg/d)	DAD (mg/kg/d)	ILCR	% Contrib. Total ILCR	DAD (mg/kg/d)	HQ	% Contrib. HI
Iron	7,359	0.01	NA	3.0E-01	6.8E-06	--	--	4.8E-04	1.6E-03	100.0%
					Total ILCR:	--	--	Total HI:	1.6E-03	100.0%

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.

ADULT CONSTRUCTION WORKERS - FUTURE SCENARIO
INHALATION OF FUGITIVE DUSTS EMANATING FROM EXCAVATED SUBSURFACE SOIL - SITE 12 (DISPOSAL SITE NEAR WATER TOWER)
REASONABLE MAXIMUM EXPOSURE
POTENTIAL CARCINOGENIC AND NONCARCINOGENIC RISKS
CHEATHAM ANNEX SITE, NAVAL WEAPONS STATION YORKTOWN - YORKTOWN, VIRGINIA

CDI (mg/kg/d) = (Ca*RR*ET*EF*ED)/(BW*AT)
Where: Ca = C * (1/PEF)

ILCR = CDI*CSFi
HQ = CDI/RfDi

Parameter	Units	Description	Construction Workers	
CDI	mg/kg/d	Chronic daily intake	CS	(Chemical Specific)
ILCR	NA	Incremental lifetime cancer risk	CS	
CSFi	1/(mg/kg/d)	Inhalation cancer slope factor	CS	
HQ	NA	Hazard quotient	CS	
RfDi	mg/kg/d	Inhalation reference dose	CS	
Ca	mg/m3	Concentration of chemical in air as fugitive dusts	CS	
C	mg/kg	Concentration of chemical in soil	CS	
PEF	m3/kg	Particulate emission factor	1.32E+09	
RR	m3/hour	Respiration rate	2.5	
ET	hours/day	Exposure time	8	
EF	days/year	Exposure frequency	250	
ED	years	Exposure duration	1	
BW	kg	Body weight	70	
AT-C	days	Averaging time, carcinogens	25,550	
AT-N	days	Averaging time, noncarcinogens	365	

					Carcinogens			Noncarcinogens		
Parameter	C (mg/kg)	Ca (mg/m3)	CSFi 1/(mg/kg/d)	RfDi (mg/kg/d)	CDI (mg/kg/d)	ILCR	% Contrib. Total ILCR	CDI (mg/kg/d)	HQ	% Contrib. HI
Iron	7,359	5.57E-06	NA	NA	1.6E-08	--	--	1.1E-06	--	--
					Total ILCR:	--	--	Total HI:	--	--

NOTES:
-- - Not applicable.
NA - Toxicity criterion not available.