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FINAL SITE INSPECTION REPORT AREAS OF CONCERN 1, 2, 6, 7 AND 8 NWS FISC WILLIAMSBURG VA

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CH2M HILL

Final

Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, Virginia

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Executive Summary

This Site Inspection (SI) Report summarizes the data and findings obtained from investigation activities conducted at Areas of Concern (AOCs) 1, 2, 6, 7, and 8, located at the Naval Weapons Station (WPNSTA) Yorktown Cheatham Annex (CAX) (**Figure ES-1**). The objectives of the SI are to determine whether a release of hazardous constituents has occurred from past Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related activities and, if so, determine whether a suspected release warrants further action.

AOC 1, the Scrap Metal Dump, is a former debris disposal area that consists primarily of wood and metal debris that date back to the World War I era. AOC 2, the Dextrose Dump, is a small former disposal area of glass bottles and drums, and also consists of several rows of concrete foundation piers that at one time supported a Shipping House associated with the explosives manufacturing facility named the Penniman Shell Loading Plant (PSLP). AOC 6, the Penniman AOC, is comprised of five small, non-contiguous subareas associated with the former PSLP: the 1918 Drum Storage subarea (former drum storage area), the Ammonia Settling Pits subarea (wastewater settling pits), the Trinitrotoluene (TNT) Graining House Sump subarea (sump pit), the TNT Catch Box Ruins subarea (used to separate TNT particles from wastewater), and the Waste Slag Material subarea (pile of metallic slag material). AOC 7, the Drum Disposal and Can Pit Area, includes several small surface debris disposal areas containing numerous cans and a drum. AOC 8, Area South of Site 7, includes buried debris primarily consisting of metal and wood.

In November 2000, CAX was placed on the National Priorities List (NPL), which required all subsequent environmental restoration activities for the Department of the Navy (Navy) Installation Restoration (IR) sites on CAX to be conducted under CERCLA unless and until removed from CERCLA authority. SI activities at AOCs 1, 2, 6, 7, and 8 were conducted in accordance with the *Final Work Plan for Site Investigation of Various Areas of Concern, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia (*CH2M HILL, 2008a).

A "CERCLA-related release" is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response as defined in CERCLA Sections 101(14) and 101(33). In other words, a CERCLA-related release is where past site-specific activities resulted in spilling, leaking, disposing, or similar discharging of hazardous substances, pollutants, or contaminants that are subject to CERCLA regulation into the environment.

To determine whether a CERCLA-related release occurred at each of the AOCs discussed above and/or whether any release warrants further action, samples of environmental media and related data were collected for evaluation. The environmental media data were evaluated via the three-step decision analysis process. The first evaluation of the data collected was the "release assessment" (Step 1). That is, where inorganics are above background concentrations or where any other constituents (such as non-inorganics) were detected, a potential release was suspected. It is important to note that identifying a "suspected release" does not necessarily mean a CERCLA-related release occurred. Nor does it mean that if a release occurred that the release warrants further action. Additional evaluation, such as the consideration of historical site information and comparison of site-specific data to regulatory screening criteria, is then used to refine the understanding of the "suspected release." This additional evaluation is the subject of the remaining decision analysis steps. These remaining steps consider such information as CERCLA eligibility of the constituents identified, presence of exposure pathways, and conservative, where warranted, more realistic, risk-based and other screening values published by regulatory agencies. The additional evaluation also includes a holistic consideration of site-specific information (for example, historical information and media data) to make a determination of whether the potential source area at each site was sufficiently characterized, and whether the potential sources of contamination have been removed.

The outcome of the three-step decision analysis process is a conclusion of whether a CERCLA-related release likely occurred and, if so, whether the suspected release warrants further action. If no CERCLA-related release is suspected or if the data suggest a release does not warrant further action (including following source area elimination), then preparation of a no action (NA) or no further action (NFA) decision document is recommended. If a CERCLA-related release is suspected that warrants further action, recommendation for the further action is made.

For each of the AOCs investigated during this SI, the site history, data collection activities, results of the data evaluation (including the three-step decision analysis), and conclusions and recommendations are summarized in **Table ES-1**. As listed below, the following is recommended for each of the sites:

- AOC 1 – Conduct an Expanded SI for soil (hot spots), surface water and sediment (AOC 1 South only), and groundwater
- AOC 2 – Collect surface and subsurface soil samples for hexavalent chromium, iron mercury, and pH analysis to refine the COPC list and thus the removal area, then conduct an Interim Removal Action for soil and the Area 2 buried debris. No action is recommended for groundwater.
- AOC 6 (by subarea) –
  - 1918 Drum Storage – No Action for all media
  - Ammonia Settling – Conduct an Expanded SI for groundwater
  - TNT Graining House Sump and TNT Catch Box Ruins – Conduct a Remedial Investigation/Feasibility Study (RI/FS) for soil and groundwater
- AOC 7 – Conduct an Expanded SI for groundwater and an Interim Removal Action for waste/soil
- AOC 8 – Conduct an RI/FS for soil and groundwater

TABLE ES-1

Summary of Conclusions and Recommendations

Site Inspection Report: CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of 3-step Decision Analysis	Recommendations
AOC 1	Scrap Metal Dump	Unpermitted disposal area reportedly used for the disposal of scrap metal, some debris dating back to the WWI era. During 1998 site visits, two corroded, empty cylinders were observed, labeled "The Liquid Carbonic Co" (cylinders were removed from AOC 1 in April 2000).	Surficial and buried debris within two ravines denoted as AOC 1 North and AOC 1 South in this Site Inspection (SI) Report	Leaching of constituents from surficial and buried debris into soil and groundwater	11 surface soil, 10 subsurface soil, and 3 groundwater samples were collected from AOC 1 North, and 8 surface soil, 8 subsurface soil, and 4 groundwater samples were collected from AOC 1 South	The data suggest the extent of debris has been sufficiently characterized at AOC 1. Exposure to PAHs and zinc in surface soil and inorganics in groundwater may result in potential unacceptable risk to human health and the environment at AOC 1 North. Exposure to PAH's and inorganics in surface soil and inorganics in subsurface soil and groundwater may result in potential unacceptable risk to human health and the environment at AOC 1 South. Additional soil samples at AOC 1 will need to be collected to further characterize the extent of PAH and inorganic contamination in localized "hot spot" areas, as well as collection of surface water and sediment samples at AOC 1 South to determine if PAHs and inorganics have impacted these media. In addition, additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) at AOC 1 to further characterize the extent of PAHs and inorganics in soil within localized "hot spot" areas, as well as to determine if PAHs and inorganics have impacted surface water and sediment at AOC 1 South. In addition, permanent monitoring wells are recommended to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.
AOC 2	Dextrose Dump	Unpermitted disposal area containing foundation piers associated with the former Penniman Shell Loading Plant (PSLP) Shipping House. Buried dextrose bottles, respirator cartridges, several unlabeled, empty 55-gallon drums, and military clothing present.	Surficial and buried debris including drums, respirator cartridges, and dextrose bottles	Leaching of constituents from surficial and buried debris into soil and groundwater	10 surface soil, 18 subsurface soil, and 4 groundwater samples were collected from AOC 2 during historical investigations	The data suggest the extent of debris and groundwater contamination have been sufficiently characterized at AOC 2. Exposure to 4,4'-DDT, mercury, and iron in surface soil, and mercury in subsurface soil, may result in potential unacceptable risks to the environment (potential ecological receptors); however, the 4-4'-DDT concentration of potential risk is located within the proposed Area 2 removal action. If chromium is in the trivalent form and not the assumed hexavalent form, neither chromium nor arsenic would be HH COPCs in soil. Thallium exceeded human heath screening criteria in one subsurface sample location; however, this location is within the proposed Area 2 removal action. Additional surface and subsurface soil samples will need to be collected to determine: (1) the form of chromium in soil; (2) whether or not the historic mercury concentrations are background or a laboratory artifact; and (3) if iron does pose a potential ecological risk (need pH data to confirm).	Conduct an Interim Removal Action to remove debris in Area 2. In addition, collect surface and subsurface soil samples and analyze for hexavalent chromium to determine if the removal action should include arsenic and chromium "hot spots" (if chromium is in the trivalent form, neither chromium nor arsenic would be HH COPCs). Also, collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots." Lastly, collect surface soil samples and analyzed for pH and iron to determine if iron does pose a potential ecological risk and if the removal action should include iron "hot spots.". NFA for groundwater.
AOC 6	1918 Drum Storage Subarea	This subarea was formerly used for the storage of wooden barrels and 55-gallon drums when the shell loading facility was active; however, documentation regarding the contents of these barrels and drums is unknown.	Wooden barrels and/or 55-gallon drums, formerly stored at this subarea	Discharge to ground surface; leaching from soil into groundwater	6 co-located surface and subsurface soil samples, and 3 groundwater samples were collected from this subarea	The data suggest the extent of soil and groundwater contamination have been characterized within the 1918 Drum Storage Subarea. Exposure to surface soil, subsurface soil, and groundwater does not pose any potential unacceptable risk to human health or the environment above background conditions and no additional sampling is required.	NFA for all media (soil and groundwater).
	Ammonia Settling Pits Subarea	This subarea is comprised of three buildings associated with the former PSLP; ammonia settling occurred in Building 123, ammonia evaporating occurred in Building 124, and ammonia finishing occurred in Building 125. Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in these buildings is unknown.	Operations formerly conducted in this subarea	Discharge to ground surface; leaching from soil into groundwater	5 co-located surface and subsurface soil samples and 3 groundwater samples were collected from this subarea.	The data suggest the extent of soil contamination has been characterized within the Ammonia Settling Pits Subarea. Exposure to inorganics in groundwater may result in potential unacceptable risk to human health and the environment. Additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) to install permanent monitoring wells to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.
	TNT Graining House Sump and Catch Box Ruins Subarea	The TNT Graining House Sump and Catch Box Ruins were formerly used as a sump and for settling out TNT particles from wastewater associated with the TNT Graining House (Building 121). Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in Building 121 is unknown.	Operations formerly conducted in this subarea	Discharge to ground surface; leaching from soil into groundwater	7 co-located surface and subsurface soil samples and 4 groundwater samples were collected from this subarea.	Exposure to SVOCs, explosives, and inorganics in soil and inorganics in groundwater, may result in potential unacceptable risks to human health and the environment. Since the extent of SVOCs, explosives and inorganic contamination in soil and inorganic contamination in groundwater have not been sufficiently characterized, additional samples will need to be collected to characterize the nature and extent of SVOCs, explosives, and inorganics in these media.	Conduct an RI to characterize the nature and extent of contamination within soil (SVOCs, explosives and inorganics) and groundwater (inorganics - total and dissolved) and to quantify the risk associated with these media.
	Penniman Lake Surface Water and Sediment	Penniman Lake is a 48-acre surface body located in the southeastern portion of CAX. Three of the five AOC 6 subareas are located adajacent to Penniman Lake.	Ammonia Settling Pit, TNT Graining House Sump, and Catch Box Ruins Subareas	Groundwater discharge and surface runoff into Penniman Lake	1 co-located surface water and sediment samples were collected from Penniman Lake, adjacent to the Ammonia Settling Pits subarea. 1 co-located surface water and sediment samples were collected from Penniman Lake, adjacent to the two TNT subareas	The data suggest there are no potential unacceptable human health or ecological risks from exposure to Penniman Lake surface water and sediment related to the Ammonia Settling Pits or two TNT subareas. with Penniman Lake adajcent, no additional sampling of Penniman Lake will be conducted.	No additional sampling of Penniman Lake related to the Ammonia Settling Pit subarea ESI or two TNT subareas RI will be conducted. (Any future sampling of Penniman Lake will be conducted as part of the Penniman Lake RI.)
AOC 7	Drum Disposal and Can Pit Areas	Two unlined, nonpermitted disposal areas whose date(s) of debris disposal is unknown. Debris identified within the former Drum Disposal Area included empty 55-gallon drums, while debris identified within the Can Pit included amber glass Clorox bottles and 4-inch tall clear bottles buried below the 5-gallon rusted cans. The can labeling contained the word "tetrachloroethane."	A former surficial 55-gallon drum and buried 5-gallon cans	Discharge to the ground surface from the former 55-gallon drum and 5-gallon cans to ground surface; leaching from soil to groundwater	10 test pits were installed to determine the vertical and horizontal extent of debris; 7 co-located surface and subsurface soil samples and 4 groundwater samples were collected	The data suggest the extent of debris has been sufficiently characterized at AOC 7. Exposure to lead, manganese, and zinc in surface soil may result in potential risks to the environment (ecological receptors) and exposure to ethylbenzene and inorganics in groundwater may result in potential unacceptable risks to human health at AOC 7. Additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) to install permanent monitoring wells to confirm the results of elevated ethylbenzene and inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction. In addition, conduct an Interim Removal Action to remove buried debris and to mitigate surface soil inorganic contamination in the Can Pit and to mitigate surface soil inorganic contamination at a localized hot spot within the former Drum Disposal Area.

TABLE ES-1

Summary of Conclusions and Recommendations

Site Inspection Report: CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of 3-step Decision Analysis	Recommendations
AOC 8	Unnamed AOC south of Site 7	An unlined, nonpermitted disposal area whose date(s) of debris disposal are unknown. Debris identified at AOC 8 during the SI includes wood, concrete, glass, plexiglass, various metal debris (wire, piping, fencing, bars, rods, chains), construction debris (bricks, burned and unburned wood, nails, burlap, plexiglass shards), a chalky, blue powder, steel cylinders, a metal container, and cable.	Surficial and buried debris	Leaching of constituents from surficial and buried debris into soil and groundwater	26 test pits were installed to determine the vertical and horizontal extent of debris; 9 co-located surface and shallow subsurface soil samples and 4 groundwater samples were collected throughout the site; 3 deep subsurface soil samples were collected from the 3 test pits with the most extensive debris	The data suggest the extent of buried debris, soil and groundwater have not sufficiently been characterized at AOC 8. Exposure to surface and buried debris, benzo(b)fluoranthene and Aroclor-1260 in soil and PCE and arsenic in groundwater may result in potential unacceptable risks to human health. Since the extent of buried debris has not been characterized, additional test pitting activities are needed to characterize its extent. In addition, additional samples will need to be collected to characterize the nature and extent of benzo(b)fluoranthene and Aroclor-1260 in soil and additional samples will need to be collected to characterize the nature and extent of PCE and arsenic in groundwater.	Conduct an RI to characterize the nature and extent of contamination within soil (PAHs, PCBs, and inorganics) and groundwater (VOCs and inorganics - total and dissolved), quantify the risks associated with these media, and verify groundwater flow direction. Additional test pitting is recommended to determine the horizontal extent of buried debris at AOC 8 [due to the depth of debris, vertical delineation may not be possible, but is expected to not extent beyond the groundwater table (~30 feet below ground surface)] and to verify the presence/absence of buried debris outside the bermed area. Since the extent of the southern area of buried debris was not delineated, collection of additional soil samples is recommended in this area.

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Legend

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Figure ES-1
Location of AOCs 1, 2, 6, 7, and 8
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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Acronyms and Abbreviations

AOC	area of concern
ATSDR	Agency for Toxic Substances and Disease Registry
AVS	acid volatile sulfide
$BaCO_3$	barium carbonate
$BaSO_4$	barium sulfate
bgs	below ground surface
CAX	Cheatham Annex
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Action—Navy
COPC	constituents of potential concern
CSM	conceptual site model
˚F	degree(s) Fahrenheit
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DO	dissolved oxygen
DOD	United States Department of Defense
DPT	direct-push technology
Dupont	DuPont de Nemours Company
EC_{50}	effect concentration to 50 percent of the population
EFH	Essential Fish Habitat
EPC	exposure point concentration
ESI	Expanded Site Inspection
ESV	ecological screening value
FFA	Federal Facilities Agreement
FISC	Fleet and Industrial Supply Center
ft/day	feet per day
GPR	ground penetrating radar
GPS	global positioning system
HHRS	Human Health Risk Screening
HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	hazard quotient
HRS	Hazard Ranking System
IDW	investigation-derived waste
IR	Installation Restoration
LOEC	Lowest Observed Effect Concentration
µm	micron
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MCL	Maximum Contaminant Level
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram

mm	millimeter
MPPEH	material potentially presenting an explosives hazard
msl	mean sea level
NA	no action
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NFA	no further action
NOEC	No Observed Effect Concentration
NPL	National Priorities List
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate
PPE	personal protective equipment
ppm	parts per million
ppt	parts per thousand
PSA	Preliminary Screening Area
PSLP	Penniman Shell Loading Plant
PVC	polyvinyl chloride
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RSL	Regional Screening Level
SEM	simultaneously extracted metals
SI	Site Inspection
SOP	standard operating procedure
SSA	Site Screening Area
SSL	Site Screening Level
SVOC	semivolatile organic compounds
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TNT	trinitrotoluene
TOC	total organic carbon
UCL	upper confidence limit
UFP-SAP	Uniform Federal Policy Sampling and Analysis Plan
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UTL	upper tolerance limit
VDCR	Virginia Department of Conservation and Recreation
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compound

WPNSTA	Naval Weapons Station
WWI	World War I
yd^3	cubic yard

SECTION 1

Introduction

This Site Inspection (SI) Report presents the data and findings obtained from investigation activities conducted at the following five Areas of Concern (AOCs), located at the Naval Weapons Station (WPNSTA) Yorktown Cheatham Annex (CAX) in Williamsburg, Virginia (**Figures 1-1** and **1-2**):

- **AOC 1** (Scrap Metal Dump) - a former debris disposal area, consisting primarily of concrete and metal debris and some wood debris (e.g., old railroad ties)
- **AOC 2** (Dextrose Dump) - a former disposal area, consisting of glass bottles filled with dextrose (sugar) water, unused respirator cartridges, empty 55-gallon drums, and unused military uniforms
- **AOC 6** (Penniman AOC) - five separate sub-areas related to activities of the former Penniman Shell Loading Plant (PSLP), which operated during World War I (WWI) on the property that now houses CAX
- **AOC 7 (**Drum Disposal and Can Pit Area) - a former disposal area, consisting of a few rusted, empty 55-gallon drums scattered about the ground surface and an open pit containing rusted, empty 5 -gallon pails and glass bottles
- **AOC 8** (Area South of Site 7) – a former disposal area containing buried, construction-type debris (for example, metal pipes and wood)

This report was prepared under the Department of the Navy (Navy), Naval Facilities Engineering Command (NAVFAC), Mid-Atlantic Division, Comprehensive Long-term Environmental Action—Navy (CLEAN) N62470-08-D-1000, Contract Task Order 056, for submittal to NAVFAC, United States Environmental Protection Agency (USEPA) Region 3, and the Virginia Department of Environmental Quality (VDEQ). The Navy, USEPA, and VDEQ work jointly as the CAX Tier I Partnering Team.

In 1998, AOCs 1 and 2 were identified as potential sources of contamination during a site visit by the Navy, USEPA, and VDEQ (Navy, 2005). In 1999, the USEPA conducted a limited SI of the former PSLP and identified potential sources of contamination. From this list of potential sources, five were chosen and designated as AOC 6 (Navy, 2005). The Navy discovered AOC 7 in the woods behind the CAX warehouse area in 2004 (Navy, 2005). A 1999 field investigation conducted at an area thought to be Site 7 (WWI disposal area) revealed it was actually a more recent disposal area (Baker, 2001b), and it was re-designated as AOC 8 (Baker, 2001b).

The SI field activities were conducted at the five AOCs from October through December 2008, to determine whether a release of hazardous constituents has occurred from past Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-related activities and, if so, determine whether a suspected release warrants further action. Investigation activities were conducted in accordance with the *Final Work Plan for Site Investigation of Various Areas of Concern* (CH2M HILL, 2008a), denoted in this report as the SI Work Plan[1].

1.1 Objectives and Approach

The overall objectives of the SI are to determine whether a release of hazardous constituents to environmental media has occurred from past CERLCA-related activities, and determine the appropriate path forward for each AOC. The specific objectives of and approach of the SI is as follows:

- Further characterize the environmental media at each AOC.
- Determine whether a suspected release warrants further action for those sites where a release attributed to CERCLA-related activities is suspected (based on historical information, constituent-specific information,

[1]The SI Work Plan stated the findings and recommendations for AOC 1 would be documented in a separate report, as a supplement to the 2001 SI (Baker, 2001a) report. However, it was later decided that one report for all five AOCs would suffice.

comparison of the detected concentrations to background levels and screening values, and, where warranted, evaluation of the screening value exceedances).

1.1.1 Decision Analysis

To achieve these objectives, a series of evaluations was conducted using the historical information and sample data for each site. This evaluation process consisted of three steps as follows:

Step 1—Determination of Potential CERCLA Eligibility and, if CERCLA-Eligible, Has a CERCLA-Related Release Occurred at the Site?

To have a standard evaluation process for all AOCs, the first phase of Step 1 in the decision analysis is to determine if an AOC is potentially CERCLA-eligible by evaluating information included in historical records, aerial photographs, and site visit observations. If the AOC is determined to be CERCLA-eligible—that is, if it is reasonable to assume CERCLA hazardous substances may have been released at the site—site-specific analytical data are evaluated, if available.

Because it was determined that all AOCs included in this SI Report warranted sampling as part of an SI, it is assumed that these sites are potentially CERCLA-eligible, and the second phase of Step 1 is conducted to determine if there has been a potential CERCLA-related release at each AOC. A "CERCLA-related release" is a release of hazardous substances, pollutants, and contaminants eligible for CERCLA response as defined in CERCLA Sections 101(14) and 101(33).

A potential release is suspected if any inorganic constituents inconsistent with background concentrations are detected or if any non-inorganic constituents are detected. To help determine whether site-specific inorganic concentrations are inconsistent with background inorganic concentrations, at a minimum, discrete sample concentrations are compared to the CAX background concentrations for individual inorganics. If it is determined that a release has occurred, the process continues to Step 2.

Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a—Comparison to Conservative Screening Values

If a CERCLA-related release is suspected, site-specific data (that exceed background, if available) are compared in Step 2a to the most conservative screening values, which comprise (as applicable), the following:

- USEPA Regional Soil Screening Levels (SSLs) for protection of groundwater (soil) (November 2010)
- USEPA Regional Screening Levels (RSLs) for industrial and residential soil (soil), residential soil (sediment), and Tap Water (groundwater and surface water), adjusted as appropriate (for non-carcinogenic effects) (November 2010 and June 2011[2])
- Federal Safe Drinking Water Act (Title 40 of the Code of Federal Regulations [CFR], Part 141) Maximum Contaminant Levels (MCLs) (groundwater)[3]
- Site-specific ecological screening values (ESVs) (soil, groundwater, surface water, sediment) (sources included in Table B-1 of the ecological risk screening appendix)[4]

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[2] The November 2010 values were the values available when the draft document was prepared. The June 2011 RSL table update became available while the draft document was undergoing regulator review. Since the recommendation for the AOC 6 1918 Drum Storage subarea is NFA, its HH screen was re-run with the June RSLs to determine if NFA was still an appropriate recommendation. None of the other risk screens were re-run with any of the June 2011 RSL values. Also, with the June 2011 RSL table update, soil and tap water RSL values have been established for thallium (previously there were none). Therefore, the draft revisions included a comparison of the results against the new thallium RSLs.

[3] Although unfiltered (total) and filtered (dissolved) groundwater samples were collected, only unfiltered samples were analyzed in the human health risk screening evaluation; analytical data from the filtered groundwater samples were reviewed for qualitative purposes only. (See Appendix A, Section A.2.1 for details)

[4] Although both total and dissolved groundwater data are included in the ecological screening tables, only dissolved metals data are considered when selecting COPCs. The dissolved concentrations are likely to be more representative of what would be transported via the groundwater than the total concentrations. (See Appendix B, Section B.2 for details.)

- Background soil values for inorganics (CH2M HILL, 2011).

Additionally, on a site-specific basis, other screening criteria are used for data comparison. Toxicity Characteristic Leaching Procedure (TCLP) sample screening criteria used during the SI for investigation-derived waste (IDW) are provided in USEPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*

For the SI, it is appropriate to compare only those site-specific concentrations above background to risk-based screening criteria because the objective of the SI is to not only determine whether a CERCLA-related release has occurred, but also to assess if the release warrants further investigation or action. Background, therefore, must be considered as part of this process. The CAX background UTLs are documented in the Final Background Report (CH2M HILL, 2011).

Step 2b—Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

For constituents that are found above the conservative screening values during Step 2a, an additional evaluation using more realistic assumptions is conducted in Step 2b. This additional evaluation was conducted to help determine if further investigation or action would be warranted. For the purposes of this SI, the more realistic evaluation involved completing a qualitative risk screening to determine if those constituents exceeding conservative screening values posed a potential risk to human health and the environment. This process allows a "look ahead" to see what the likely risk drivers (if any) will be at the site. If the recommended path forward for an AOC is an Expanded SI or Remedial Investigation, the entire SI data set would be carried forward for further quantitative risk assessment. Human health and ecological risk screenings were conducted for each AOC. Details regarding the steps and processes used to conduct the human health and ecological risk screenings are provided in **Appendices A and B**, respectively.

Step 3—Is Further Investigation or Action Required?

For Step 3, the results of Step 2, the historical site information, spatial distribution of constituents, and constituent concentrations are evaluated to ensure that the potential source area for a CERCLA-related release has been sufficiently characterized. If the characterization is complete, recommendations for a path forward will be provided. If the recommended path forward is further investigation, the details regarding its implementation will be submitted under separate cover in a Uniform Federal Policy Sampling and Analysis Plan (UFP-SAP).

1.2 Organization of the SI Report

The SI Report is organized as follows:

- **Section 1, Introduction,** provides the objectives and decision analysis process of the SI and describes the physical characteristics of CAX.
- **Section 2, Investigation Methodology,** summarizes the SI investigation and data collection activities.
- **Sections 3 through 7** includes the history of investigations, conceptual site model (CSM), including site history, the site physical setting, distribution of contamination and human health and ecological risk evaluations, and the decision analysis for each AOC. Each section also includes the conclusions and recommendations for the particular AOC.
- **Section 8, References,** lists the documents used in preparation of this report.

Tables and figures are presented at the end of each section, as applicable.

1.3 Physical Characteristics of CAX

This subsection summarizes the environmental setting of CAX, including a description, history, land use, climate, topography, surface water, hydrogeology, and ecological resources. Site-specific information pertinent to the release assessment is included in the site-specific sections.

1.3.1 CAX Description and History

CAX consists of 2,300 acres of land on the York-James Peninsula, northwest of WPNSTA Yorktown (**Figure 1-1**). CAX is bordered by Colonial National Historical Park on the northwest and east, Queens Lake subdivision to the west, and the city of Williamsburg to the south and southwest. It is divided into two separate parcels, with the larger parcel situated along the banks of the York River and the smaller parcel located south of the Colonial Parkway and encompassing Jones Pond. The majority of CAX is undeveloped and heavily wooded.

CAX had been the location of the former PSLP, a large powder and shell loading facility operated by the DuPont de Nemours Company (Dupont) during WWI. The facility closed in 1918 and the property was used for farming or remained idle until CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot. From 1943 to present, CAX has performed services in support of Naval ordnance missions that include packing and shipping materials, warehousing, inventory management, local delivery, fuel management and distribution, technical support, customer service, and care of sponsor-owned material. In 1987, CAX was designated the Hampton Roads Navy Recreational Complex. Today, the mission of CAX also includes providing recreational opportunities to military and civilian personnel, with outdoor recreational facilities including cabins, camp sites, an 18-hole golf course, swimming pool, ball fields, freshwater and saltwater fishing areas, boating, wildlife watching, and hunting.

In October 1998, control of CAX was transferred from Fleet and Industrial Supply Center (FISC) to WPNSTA Yorktown. On November 30, 2000, CAX was included on the National Priorities List (NPL). The CAX Federal Facilities Agreement (FFA) was signed March 2005 and identified a total of 12 sites and seven AOCs (Navy, 2005). The AOCs addressed in the SI (AOCs 1, 2, 6, 7, and 8) are depicted in **Figure 1-2**. All of these AOCs, with the exception of AOC 1, are located within the main portion of CAX.

1.3.2 Current and Potential Future Land Use

Land use at CAX is categorized as Military Use according to the York County Planning Division 2025 Land Use Map (York County, Virginia, Planning Division, 2005). Land uses of areas surrounding CAX include conservation, recreation, commercial, residential, industrial, public, and agricultural (Baker, 2003). The future land use at CAX is expected to remain unchanged. Potable water at CAX is provided by Newport News Waterworks (ASTDR, 2004).

1.3.3 Climate

The climate of the Virginia Peninsula is influenced by the moderating effects of the Atlantic Ocean. This results in mild winters and long, warm summers. High humidity frequently occurs along the coast and less frequently inland. Ground fog is frequent in the late summer, especially during the early morning hours. Freezing temperatures occur intermittently from October through March. Average monthly temperatures in the area range from approximately 38.8 degrees Fahrenheit (˚F) in January to 77.4˚F in July (Baker, 2003).

Because of its location near the coastline, York County is subject to easterly storms throughout late summer and early fall, causing high tides and flooding. Intense hurricanes occasionally sweep the coast. Winter is characterized by storms that move along the eastern seaboard. The storms from the north are associated with high winds and precipitation occasionally in the form of snow, sleet, or rain; however, snow is seldom prolonged or heavy. The average annual precipitation is 44 inches, with summer months being the wettest and winter months being the driest (Baker, 2003).

Spring is a period of contrasting weather, particularly during March, with periods of frost. Summer is warm and humid with occasional showers and afternoon thunderstorms. Autumn is a season of comfortable temperatures averaging 60˚F to 81˚F and generally pleasant weather (Baker, 2003).

Winds are highly variable in the CAX area with prevailing winds usually from the south-southwest, although north-northeasterly winds are common in some months. Onshore winds predominate during the spring and summer (Baker, 2003).

1.3.4 Topography and Surface Water

The topography at CAX is characterized by gently rolling terrain dissected by ravines and stream valleys trending predominantly northeastward toward the York River. Ground elevations at CAX vary from sea level along the

eastern boundary, which borders the York River, to a maximum elevation of approximately 50 feet above mean sea level (msl) on a few scattered hills in the western portion of the Annex. Valleys consisting of 40- to 60-foot ravines with steep slopes (slopes exceeding 1:1) occur along the major creeks draining CAX (Baker, 2003). CAX is bordered on the west by Cheatham Pond, on the north by the mouth of Queen Creek, on the east by the York River, and on the south by King Creek. In 1943, dams were constructed to create the 108-acre Cheatham Pond from Queen Creek, as well as the 43-acre Penniman Lake from King Creek. Both Queen Creek and King Creek are tidal; however, Cheatham Pond and Penniman Lake are not. Damming a portion of the Cub Creek watershed formed Jones Pond, a 69-acre freshwater non-tidal pond enclosed by several wooded ravines and located in the northwestern section of CAX. Numerous small creeks flow through wooded ravines throughout CAX and drain into tidal creeks that join the York River. In most areas, forests extend to the marsh and lake margins. The tributaries of CAX all drain into the York River (Baker, 2003). The Walt Feurer Youth Pond (2 acres) and the Cat Fish Pond (1 acre) are shallow, warm water, man-made ponds (Navy, 1998).

1.3.5 Geology

CAX is located in the Atlantic Coastal Plain Physiographic Province which is underlain by multiple layers of unconsolidated sediments of Quaternary, Tertiary, and Cretaceous ages (**Figure 1-3**). The granite rock formations of the Appalachian Mountains were eroded and sediment was transported from the mountains by rivers and streams to the coast, building up layers of sediment that fanned out onto the continental shelf. Successive sea level rises deposited fluvial estuarine and marine sediment, further building the Coastal Plain. Widely fluctuating sea levels split the Coastal Plain into river terraces of different elevations bounded by scarp features resulting from shoreline erosion. The Coastal Province is comprised of four terraces: Lackey Plain, Croaker Flat, Huntington Flat, and Grafton Plain (from highest to lowest); and three scarps: Kingsmill, Lee Hall, and Camp Peary. As depicted in **Figure 1-4**, CAX is within the Lackey Plain and Croaker Flat terraces separated by the Camp Peary scarp located along the York River (Brockman et al., 1997).

A total of 10 geologic formations have been identified (Brockman et al., 1997) beneath CAX. The upper most geologic formations consists of alluvial, colluvial, and marsh deposits composed of silt, sand, and pebbles with some clay.

A 1985 soil survey report prepared by the Soil Conservation Service identified four soil association groups at CAX (USDA, 1985). A general soil association map for CAX is shown on **Figure 1-5**, while a more detailed description of the soil associations is provided in the soil survey.

1.3.6 Hydrogeology

The 10 geologic units beneath CAX are grouped into hydrostratigraphic units based on hydraulic characteristics. The aquifers separated by confining/semi-confining units relevant to CERCLA investigations at CAX are, from youngest to oldest, the Columbia aquifer, the Cornwallis Cave aquifer, and the Yorktown-Eastover aquifer. Groundwater flow is locally controlled by topography with discharge to nearby surface water bodies and a primary flow and discharge direction toward the York River.

Where present, the Columbia aquifer ranges in thickness from 5- to 10-feet thick, with horizontal hydraulic conductivity between about 0.4 to 8 feet per day (ft/day) and vertical hydraulic conductivity between 2×10^{-4} to 0.2 ft/day (Brockman et al., 1997). The hydraulic properties of the Cornwallis Cave aquifer are highly variable because of depositional effects and physical and geochemical weathering. In general, horizontal hydraulic conductivity ranges from 0.3 to 9 ft/day and vertical conductivity ranges from 6×10^{-4} to 0.2 ft/day (Speiran and Hughes, 2001). The Cornwallis Cave aquifer is absent beneath the Croaker Flat (Brockman, et al, 1997), thus the Yorktown-Eastover aquifer is the first groundwater encountered in this area (**Figure 1-4**). The thickness of the Yorktown-Eastover aquifer across CAX ranges from 60 to 100 feet. Horizontal hydraulic conductivity ranges from 0.004 to 3 ft/day and vertical hydraulic conductivity ranges from 2×10^{-5} to 0.5 ft/day.

1.3.7 Ecological Resources

Terrestrial flora on CAX consists predominantly of woodland species (Baker, 2005a). The following three types of forest are present:

- Pine stands composed primarily of loblolly and Virginia pines
- Mixed pine and hardwood stands
- Hardwood stands

Elevated areas are the predominant locations of pine stands, while hardwood stands are found on slopes and ravines. Native tree species found at CAX include beech, black cherry, red maple, sweet gum, various pines, white ash, and white oak. The woodland's understory is composed of various seedling trees and vine species, such as Virginia creeper, briars, and honeysuckle. Ferns are found in many moist, shaded areas. Ornamental trees and shrubs have been planted in the improved areas and along major roadways. None of the plant species that occur on CAX are listed on the federal or Commonwealth endangered lists (Baker, 2005a).

Small, undeveloped tracts of land at CAX support a variety of indigenous wildlife species. Whitetail deer, beaver, skunks, bobcats, red and gray foxes, squirrels, raccoons, opossums, and rabbits are present. Game birds, such as wild turkey, quail, duck, and pheasants, are also residents. Songbirds common to the eastern Virginia area are in abundance at CAX, along with a raptor population consisting of small hawks, owls, and osprey. Carrion-feeding birds such as crows and turkey vultures are also common. The southern bald eagle (federally and state protected) is known to nest nearby at WPNSTA Yorktown. Suitable habitat exists for roosting and perching in the area, but only occasional sightings of eagles have been made (Baker, 2005a).

Wetlands are mainly found along principal tributaries to the York River and along the York River shoreline at CAX. The following four major marsh types exist along these margins:

- Saltmarsh cordgrass communities
- Big cordgrass communities
- Cattail communities
- Brackish water mixed communities

Freshwater wetlands are also present within the interior, non-tidal areas of the installation.

Salinities in the York River estuary bordering CAX can be characterized as mesohaline (from 15 to 20 parts per thousand [ppt]), and can fluctuate depending on seasonal impacts, runoff, and rainfall. Of the 295 fish species known from the Chesapeake Bay, only 32 are year-round residents. Nursery areas, foraging areas, and spawning ground attract the remaining species from the Atlantic Ocean and freshwater tributaries each year. In the York River, resident fish include hogchoker, weakfish, and oyster toadfish. Spot and croaker are common in nursery and foraging areas in the summer and numerous anadromous and catadromous fish use the area during migration, including the alewife, American eel, American shad, blueback herring, striped bass, and white perch. Commercially and recreationally important species from the York River include American shad, bay anchovy, blue crab, bluefish, croaker, spot, striped bass, summer flounder, and weakfish. The York River in the vicinity of CAX is a designated crab pot fishery from March through November of each year; immediately north of CAX is a spawning and nursery ground for blue crabs. Several species of endangered sea turtles (namely the green, hawksbill, leatherback, loggerhead, and Kemp's Ridley) are known to feed in the Chesapeake Bay and occasionally forage in the York River, including in the vicinity of CAX during the summer.

The York River is designated as Essential Fish Habitat (EFH) for three species of fish managed by the Mid-Atlantic Fishery Management Council—summer flounder, bluefish, and butterfish. Though both the bluefish and butterfish use the more open, pelagic waters characteristic of the river, juvenile summer flounder often use unvegetated nearshore sandy bottoms and salt marsh creeks as nursery areas. Other species likely to use salt marsh creeks include anchovies, blue crabs, juveniles of migratory species, hard and soft-shell clams, killifish, minnows, mummichogs, oysters, silversides, and weakfish.

No federally or state-listed endangered or threatened species are currently using CAX habitats. Suitable habitat exists on CAX for both the red-cockaded woodpecker (federally endangered) and the bald eagle (formerly federally threatened and still protected by the Bald and Golden Eagle Protection Act and state threatened/ endangered). Bordering the CAX property is the York River, which provides seasonal habitat for federally and state endangered Kemp's Ridley sea turtles and federally threatened loggerhead sea turtles. The shoreline along the York River may also provide habitat for federally threatened piping plovers. Rare resources and communities identified from CAX in the Virginia Department of Conservation and Recreation (VDCR) Natural Heritage Program database and the CAX Natural Heritage Inventory include a significant great blue heron colony, low salt marsh and salt scrub habitats, coastal plain depression ponds, non-riverine wet hardwood forests, and coastal plain calcareous seepage swamps (Baker, 2005a).

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION1\FIGURE1-1_CAX LOCATION2.MXD BHATHAWA 4/19/2011 11:12:50

Legend
Activity Boundaries
City/County Boundaries

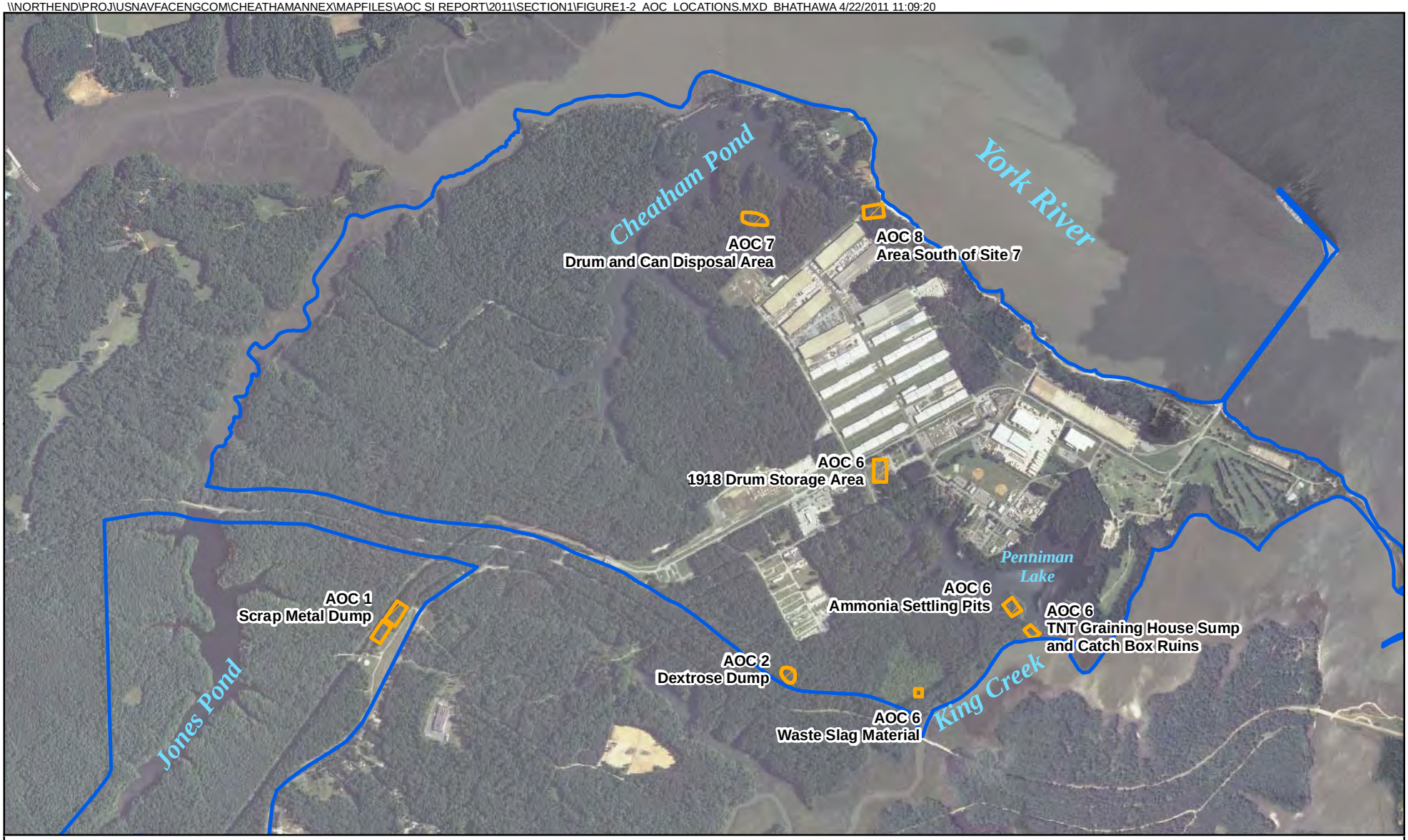
N

0 0.6 1.2 Miles

Figure 1-1
Location of CAX
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION1\FIGURE1-2_AOC_LOCATIONS.MXD BHATHAWA 4/22/2011 11:09:20



Legend

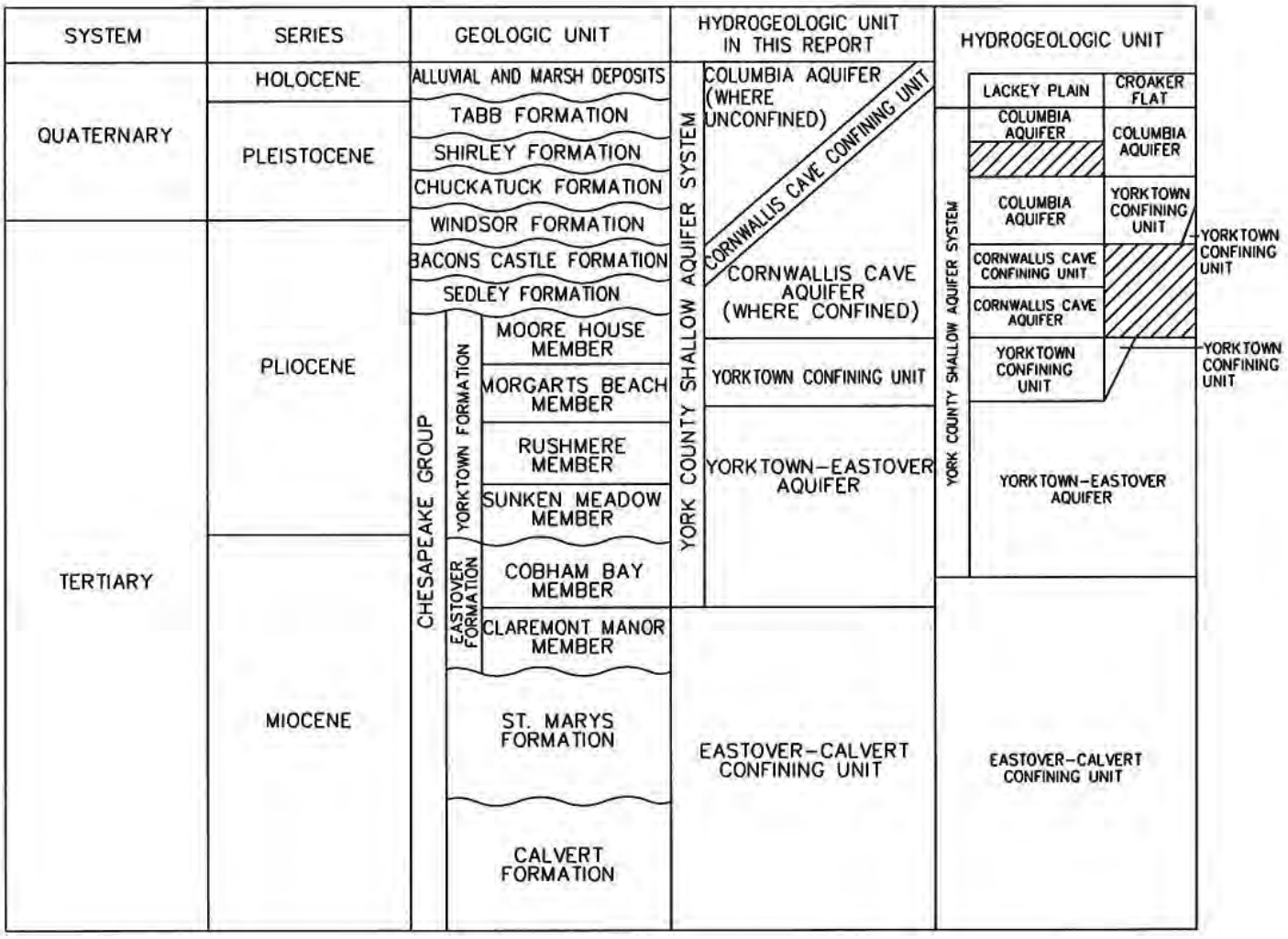
- CAX Boundary
- Active AOCs

N
W E
S

0 1,000 2,000
Feet

Figure 1-2
Location of AOCs 1, 2, 6, 7, and 8
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL



Source: Brockman, ET AL 1997 GEOHYDROLOGY OF THE SHALLOW AQUIFER SYSTEM, NAVAL WEAPONS STATION YORKTOWN, YORKTOWN, VIRGINIA

Figure 1-3
Hydrogeologic Units in York County
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

NOT TO SCALE

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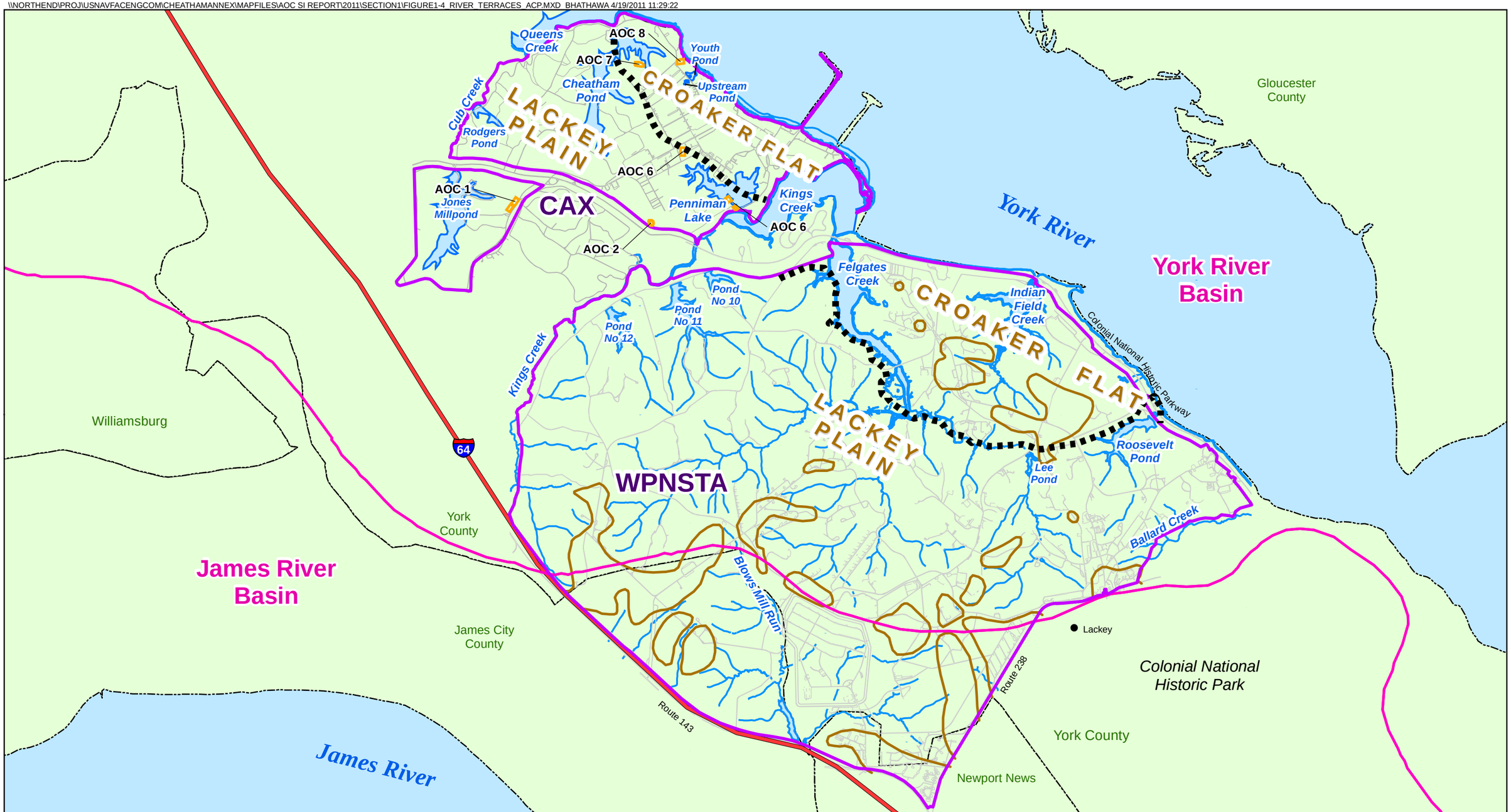
\\northend\proj\USNavFacEngCom\CheathamAnnex\Figures\AOC_SI_Report\2011\ai\Section1\Figure1-3_Hydrogeologic_Units.ai

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION1\FIGURE1-4_RIVER_TERRACES_ACP.MXD BHATHAWA 4/19/2011 11:29:22



Legend

- Activity Boundaries
- Camp Peary Scarp
- Watershed Boundaries
- Interstate 64
- Approximate Boundary of Columbia Aquifer, February 3, 1997
- Roads
- Shoreline and Water Bodies
- City / County Boundaries
- Site Boundaries

N

0 4,000 8,000 Feet

Figure 1-4
River Terraces of the Atlantic Coastal Plain
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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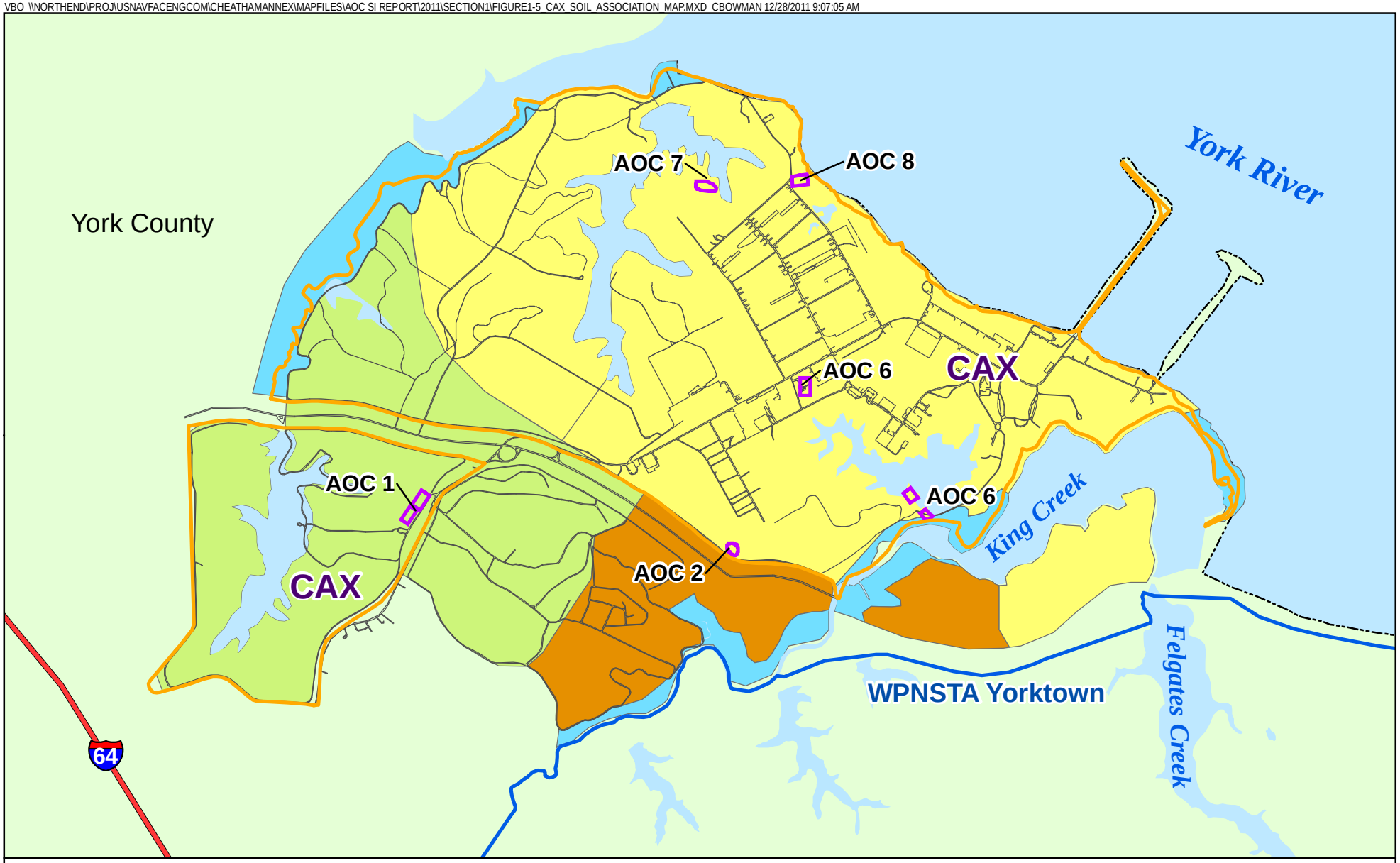
VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION1\FIGURE1-5_CAX_SOIL_ASSOCIATION_MAP.MXD CBOWMAN 12/28/2011 9:07:05 AM



Legend

Cheatham Annex Soil Associations

- Bohicket, Johnson, and Axis (1)
- Dogue, Pamunkey, and Uchee (2)
- Slagle, Emporia, and Craven-Uchee Complex (3)
- Emporia, Emporia Complex, Kempsville, and Craven-Uchee Complex (4)
- CAX Boundary
- WPNSTA Yorktown Boundary
- Site Boundaries

N W E S

0 1,250 2,500 Feet

Figure 1-5
General Soil Association Map
Areas of Concern 1, 2, 6, 7, and 8
Site Inspection Report
Cheatham Annex
Williamsburg, Virginia

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SECTION 2

Investigation Methodology

This section summarizes the field investigation procedures of the SI conducted at the five AOCs from October through December 2008. The SI activities were conducted in accordance with the SI Work Plan (CH2M HILL, 2008a) and the Master Project Plan, *Final Master Project Plan, Naval Weapons Station Yorktown, Yorktown, Virginia and Cheatham Annex Williamsburg, Virginia* (Baker, 2005b).

Table 2-1 summarizes the environmental data collected by site, media, analyses performed, sample nomenclature, and sample depth during the SI for AOCs 1, 6, 7, and 8 and also includes the historical environmental data collected at AOC 2. Environmental data collected during the 2008 SI field activities include the following:

- Surface soil, shallow subsurface soil, and direct-push technology (DPT) groundwater sampling at AOCs 1, 6, 7, and 8
- Test pitting and deep subsurface soil sampling at AOCs 7 and 8
- Surface water and sediment sampling at AOC 6
- Ground penetrating radar (GPR) data from AOC 6

As stated in the SI Work Plan (CH2M HILL, 2008a), it was assumed that the existing data set was sufficient and no additional sampling was necessary at AOC 2. Previous investigations identified the horizontal and vertical extent of disposed material. For those areas of AOC 2 where debris has been identified and sampling was not conducted, the debris is inert (for example, dextrose bottles, deer carcasses, military uniforms) and is not considered a CERCLA source. In AOC 2 where respirator cartridge canisters and 55-gallon drums were identified, analytical data are adequate to support a qualitative risk screening approach and background comparison in order to determine whether a release has occurred that may pose an unacceptable risk at AOC 2. The investigation methodology from the previous investigations at AOC 2 is not summarized in this report and can be found in the historical investigation reports (RMI, 1998; Baker, 1999, 2001b, and 2002). With the exception of the AOC 2 historical data, only the 2008 SI analytical data were used in the human health and ecological risk screenings conducted for AOCs 1, 6, 7, and 8.

A summary and discussion of the specific SI field activities are included in Sections 3 through 7. Any deviations from the SI Work Plan are discussed in these site-specific sections.

2.1 Pre-Investigation Activities

Before SI 2008 field investigation activities, underground utility clearance was conducted at each site on October 15, 2008, by Accumark Inc. of Ashland, Virginia.

2.2 Potential Munitions Avoidance Support

CH2M HILL provided munitions and explosives concern (MEC)/material potentially presenting and explosive hazard (MPPEH) avoidance support during the implementation of the field activities at AOC 6. MEC/MPPEH avoidance support was conducted during the initial excavation activities at AOC 6 on October 21, 2008, within the TNT Graining House Sump and Catch Box Ruins and Ammonia Settling Pit subareas because of the potential presence of explosives with the soil. The initial soil samples from these subareas underwent expedited laboratory analyses. Based on the analytical results of these soil samples, concentrations of explosive constituents in soil were determined to be less than 10 percent and it was determined that the remaining intrusive SI activities at AOC 6 could proceed without MEC/MPPEH avoidance.

2.3 Test Pits

Test pit investigations were conducted at AOCs 7 and 8 to identify the nature and extent of buried waste and contaminated soil. No test pits were advanced at AOCs 1 or 6 because reported historic site use and the results of previous investigations did not indicate the presence of buried waste (Baker, 2001a; Weston, 1998a,b). Test pitting was conducted using a large backhoe with a 36-inch bucket capable of digging to a depth of approximately 20 feet. Soil and waste streams encountered during test pitting were characterized and logged in accordance with Unified Soil Classification System (USCS) by a qualified geologist in accordance with the *Trenching for Landfill Delineation* Standard Operating Procedure (SOP) included in the SI Work Plan (CH2M HILL, 2008a). Upon completion of each test pit excavation, the test pit was backfilled with the excavated material. Grab soil samples were collected from within the backhoe bucket or from the bottom of the excavated area via hand auger.

2.4 Soil

Surface and shallow subsurface soil samples were collected at AOCs 1, 6, 7, and 8 to determine if site soil had been adversely impacted by historical site use. Preliminary sample locations were agreed upon by the Partnering Team before mobilization based on existing analytical results, site history, and transport mechanisms. Exact sampling locations were field determined from preliminary sample locations based on observed site conditions.

Soil samples were collected using either a hand auger, DPT-mounted drill rig, or a backhoe. The DPT drill rig and backhoe used for the collection of soil samples was operated by American Environmental Drilling of Aberdeen, North Carolina, and Parratt-Wolff Inc. of Hillsborough, North Carolina (at AOC 1 only). The DPT drill rig used a hollow-stem auger macrocore system with 4-foot acetate sleeves that encapsulated the captured soil. Soil sampling activities were conducted in accordance with the *Soil Sampling* and *Homogenization of Soil and Sediment Samples* SOPs included in the SI Work Plan (CH2M HILL, 2008a).

Surface soil samples were collected from native soil 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, deep subsurface soil samples were collected at AOC 7 (native subsurface soil samples CAA07-SBTP04-1008, CAA07-SBTP06-1008, and CAA07-SBTO05-1008) and AOC 8 (native subsurface soil samples CAA08-SBTP14-1008 and CAA08-SBTP24-1008; non-native soil sample CAA08-SBTP19-1008) from the bottom of test pits considered to be potentially impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris.

Depending on the AOC, soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), total metals, cyanide, total organic carbon (TOC), pH, and grain size. **Table 2-1** summarizes the analytical parameters for each AOC. Directly following soil collection, VOC samples were prepared first by pushing the non-homogenized soil directly into laboratory provided bottleware while attempting to minimize headspace. After the VOC samples were collected, the remainder of the collected soil was homogenized in a stainless steel bowl and then transferred to the appropriate laboratory which provided sample containers for all other sample analytes. After preparation, samples were packed on ice and shipped to the laboratory for analysis at the end of each day in accordance with the CH2M HILL SOP entitled *Sample Preservation*.

Table 2-1 summarizes the soil samples collected at each site. Locations of soil samples collected during the investigation activities are described in Sections 3 through 7 for the various AOCs.

2.5 Groundwater

The DPT method was used to install temporary monitoring wells and collect discrete groundwater samples at AOCs 1, 6, 7, and 8, in order to determine if site groundwater had been adversely impacted by historical site use. Preliminary sample locations were agreed upon by the Partnering Team before mobilization based on existing analytical results, potential site risks, and transport mechanisms. Exact sampling locations were field determined from preliminary sample locations based on observed site conditions. Temporary well installation and

groundwater sampling activities were conducted in accordance with applicable SOPs as listed below. Locations of temporary wells installed during the investigation activities are described in site-specific Sections 3 through 7.

2.5.1 DPT Groundwater Sampling

Before groundwater sample collection, a DPT drill was used to collect continuous macrocore soil cores in 4-foot long acetate sleeves. Soil borings were characterized and logged in accordance with the USCS by a qualified geologist. A boring log was created for each temporary well location and they are provided in **Appendix C**.

At AOCs 1, 6, 7, and 8, temporary wells were installed within the aquifer where groundwater was first encountered, at depths ranging between 6 and 36 feet bgs, set approximately 4 feet below the water table as observed during logging of soil cores. Temporary wells were advanced using retractable steel rods fitted with an expendable drive point and with a polyvinyl chloride (PVC) machine-slotted 0.01-inch screen to approximately 2 feet below where groundwater was first encountered (**Table 2-2**). At the desired sampling interval, extension rods were sent downhole to hold the screen in place while the tool string and sheath were retracted, releasing the expendable drive point and exposing the desired length of screen. The bore holes were allowed to cave-in around the PVC screen. Temporary well installation activities were conducted in accordance with the CH2M HILL SOP entitled *Monitoring Well Installation*.

DPT groundwater samples were collected using a peristaltic pump in accordance with the *Low-Flow Groundwater Sampling from Monitoring Wells* SOP included in the SI Work Plan (CH2M HILL, 2008a), in order to minimize drawdown and to obtain a sample representative of groundwater conditions in the surrounding geologic formation. In general, the sample collection depth was approximately 0- to 2-feet below the water table.

Collection of groundwater samples was attempted within approximately 5 minutes of low-flow purging, regardless of the observed turbidity since groundwater collected from the DPT is considered to be representative of groundwater in that sample interval and did not require significant purging. New dedicated Teflon tubing was used for sampling each DPT groundwater sample location. Measurements of pH, oxidation-reduction potential (ORP), temperature, specific conductance, turbidity, and dissolved oxygen (DO) were collected during purging in accordance with the *Field Measurement of pH, Specific Conductance, Turbidity, Dissolved Oxygen, ORP, and Temperature Using the Horiba® U-22 with Flowthrough Cell* SOP included in the SI Work Plan (CH2M HILL, 2008a). Groundwater quality measurements obtained before sample collection for each temporary well are presented in **Table 2-2**.

Depending on the AOC, groundwater samples were analyzed for VOCs, SVOCs, PAHs, pesticides/PCBs, and total and dissolved metals, mercury, and cyanide. **Table 2-1** summarizes the analytical parameters for each AOC. After preparation, samples were packed on ice and shipped to the laboratory for analysis at the end of each day in accordance with the CH2M HILL SOP entitled *Sample Preservation*.

2.5.2 Borehole Abandonment

Temporary wells were abandoned immediately following the completion of groundwater sampling at each well. The PVC portion of the well was pulled from the ground using the DPT rig while the disposable end points were left in place. The PVC screen was broken down, decontaminated, and disposed as nonhazardous, solid waste. Following well removal, the remaining void was filled with bentonite chips to ground surface.

2.6 Surface Water

Surface water samples, co-located with sediment samples, were collected from Penniman Lake, adjacent to three of the five AOC 6 subareas to determine if site surface water had been adversely impacted by historical site use. Preliminary sample locations were agreed upon by the Partnering Team before mobilization and were located near depositional areas where contaminant impacts to Penniman Lake were most likely to occur. Exact sampling locations were field determined and based on the preliminary sample locations and actual site conditions. Surface water sampling activities were conducted in accordance with the *Surface Water Sampling* SOP included in the SI Work Plan (CH2M HILL, 2008). Locations of surface water samples collected during the investigation are shown in **Section 5**.

Surface water samples were collected before sediment samples to avoid suspending sediment and skewing surface water analytical results. Surface water samples were analyzed for SVOCs, explosives (including pentaerythritol tetranitrate (PETN), 3,5-dinitroaniline, nitroglycerin, and nitroguanadine), total and dissolved metals, cyanide, and hardness. All samples were collected by submerging a clean amber glass bottle in the surface water with the mouth pointed upstream and the bottle tilted slightly downstream. Samples were then transferred from the amber bottle to appropriate laboratory prepared bottleware. Filtered metals were pumped through a 0.45 -micron (µm) filter before transferring the sample into bottleware. After preparation, samples were packed on ice and shipped to the laboratory for analysis at the end of each day in accordance with the CH2M HILL SOP entitled *Sample Preservation*. A summary of the samples collected is provided in the sample summary table (**Table 2-1**).

During the surface water sample collection, the water quality parameters pH, ORP, temperature, specific conductance, turbidity, and DO were recorded on a loose sheet of paper instead of in a field lob book, which was a deviated from the SI Work Plan and the specifications of the SOP entitled *Preparing Field Log Books* (CH2M HILL, 2008), and the sheet of paper was subsequently lost. Therefore, the water quality parameters cannot be presented in this SI; however, this omission does not impact the quality of the collected samples.

2.7 Sediment

Co-located surface and subsurface sediment samples, also co-located with surface water samples, were collected at AOC 6 within Penniman Lake in order to determine if site sediment had been adversely impacted by historical site use. Preliminary sample locations were agreed upon by the Partnering Team before mobilization near depositional areas where contaminant impacts to Penniman Lake were most likely to occur. Sediment sampling activities were conducted in accordance with the *Sediment Sampling* and the *Homogenization of Soil and Sediment Samples* SOPs included in the SI Work Plan (CH2M HILL, 2008). Locations of surface water samples collected during the investigation are shown in **Section 5**.

Sediment samples were collected after surface water samples in order to avoid suspending sediment and skewing surface water analytical results. Sediment samples were collected with an Ekman grab sampler from the side of the boat. Surface sediment samples were collected from 0- to 4-inches bgs, while subsurface sediment samples were collected from a depth of 4- to 8-inches bgs.

All sediment samples were analyzed for SVOCs, explosives, total metals, cyanide, acid volatile sulfide (AVS)/ simultaneously extracted metals (SEM), pH, TOC, and grain size. Following sediment sample collection, AVS/SEM samples were collected first by pushing the bottleware directly into the sediment sample at the target interval. After the AVS/SEM samples were collected, the remainder of the sediment was homogenized in a stainless steel bowl and then transferred to the appropriate laboratory-provided sample containers for all other sample analytes. After preparation, samples were packed on ice and shipped to the laboratory for analysis at the end of each day in accordance with the CH2M HILL SOP entitled *Sample Preservation*. A summary of the samples collected is provided in the sample summary table (**Table 2-1**).

2.8 Surveying

Sampling points and test pits were field-determined based on preliminary sample locations agreed upon by the Partnering Team before mobilization and staked at the time of sample collection. Following the completion of sampling activities, global positioning system (GPS) coordinates were collected with a hand-held GPS to record sample locations for each of the AOCs. These locations included soil samples, DPT groundwater samples, surface water and sediment samples, and test pits.

2.9 Decontamination and Waste Management

All decontamination activities were conducted in accordance with the *Decontamination of Drilling Rigs and Equipment* SOP and *Decontamination of Personnel and Equipment* SOP, as applicable (CH2M HILL, 2008). Disposable sampling equipment and personal protective equipment (PPE), such as Masterflex tubing and nitrile gloves, were treated as nonhazardous solid waste. After use, equipment was placed in plastic contractor bags and

disposed of in an onsite trash dumpster. Non-disposable sampling equipment, such as hand augers, was decontaminated before each use.

All downhole and non-disposable sampling equipment was decontaminated before and in between the collection of each sample using a high-pressure steam cleaner with potable-grade water. Pressure washing was conducted at the temporary decontamination pad. The decontamination pad consisted of a raised wood frame lined with a high-density polyethylene tarp, which acted as a basin to collect fluids. These fluids were then pumped into an appropriate 55-gallon drum to await characterization and disposal. All downhole and non-disposable sampling equipment decontamination procedures were conducted in accordance with the *Decontamination of Drilling Rigs and Equipment* SOP (CH2M HILL, 2008).

2.10 Investigation-derived Waste Management

IDW generated during the SI included well development groundwater, groundwater sampling purge water, and decontamination rinse water from downhole and non-disposable sampling equipment. IDW was containerized in approved 55-gallon drums, stored on secondary containment at the approved IDW staging location, and properly labeled. In total, three 55-gallon drums of aqueous IDW were generated during investigation activities.

Before disposal, one composite sample was collected from all aqueous drums. The IDW sample was analyzed for full TCLP analysis, ignitability, reactive cyanide, reactive sulfide, and corrosivity. The sample was collected by submerging a clean amber glass bottle in the aqueous IDW and then transferring the sample from the amber bottle to appropriate laboratory-prepared bottleware. Based on the analytical results, all IDW was identified as nonhazardous and the IDW was disposed of by Capitol Environmental Services, Inc. at the Environmental Quality Florida, Inc. landfill in Tampa, Florida, within 90 days of generation. IDW handling and disposal information are included in **Appendix D**.

2.11 Addressing Additional Work Plan Comments

Following submittal of the Navy responses to the USEPA's comments on the *Draft Work Plan for Site Investigation, Various Areas of Concern* (CH2M HILL, 2008b), the USEPA provided additional comments following submittal of the *Draft Final Work Plan for Site Investigation, Various Areas of Concern* (CH2M HILL, 2008c). The USEPA expressed concern regarding the function of what they described as "large in-ground mixing tanks" found in the shipping area and between the TNT graining house ruins and the ammonia evaporating building. No changes were made to the AOC 6 sampling plan; however, the Navy did agree to research known Penniman information regarding this item and present it in a separate technical memorandum. During the AOC 6 SI activities, one of the said "in-ground mixing tanks" was found. Therefore, while the field crew was mobilized, one DPT surface soil, subsurface soil (6 to 24 inches bgs), and groundwater sample were collected in the vicinity of the tank. These results will be included in the aforementioned technical memorandum.

In addition, the USEPA posed the question, "how did material enter and exit the ammonia settling pits and the TNT graining house," meaning did an underground piping system between the two exist? A geophysical survey was conducted in the vicinity of the former ammonia settling pits and the TNT graining house and catch box ruins to address the USEPA's concern as to whether or not these buildings have underground piping that connected them to each other or to other PSLP buildings for the transfer of explosives materials. The results of the geophysical survey are presented in **Section 5**.

2.12 Data Quality Evaluation

In order to assess the effect of the overall analytical process on the availability of the analytical data for use by the project team, a data quality assessment was conducted and the results of this assessment are summarized in **Appendix E**.

TABLE 2-1

AOC Sample Summary

Site Inspection for CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site	Subarea	Investigation	Media Sampled	Analytes	Sample Identification	Date Sampled	Top Sample Collection Depth (ft bgs)	Bottom Sample Collection Depth (ft bgs)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
AOC 1 - Scrap Metal Dump	North	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA01-SS01-1108	03-Nov-08	0	0.5	NA	NA
					CAA01-SS02-1108	03-Nov-08	0	0.5	NA	NA
					CAA01-SS02P-1108[1]	03-Nov-08	0	0.5	NA	NA
					CAA01-SS03-1108	05-Nov-08	0	0.5	NA	NA
					CAA01-SS03-1208[2]	18-Dec-08	0	0.5	NA	NA
					CAA01-SS04-1108	03-Nov-08	0	0.5	NA	NA
					CAA01-SS05-1108	03-Nov-08	0	0.5	NA	NA
					CAA01-SS06-1108	04-Nov-08	0	0.5	NA	NA
					CAA01-SS06P-1108	04-Nov-08	0	0.5	NA	NA
					CAA01-SS07-1108	05-Nov-08	0	0.5	NA	NA
					CAA01-SS07-1208[2]	18-Dec-08	0	0.5	NA	NA
					CAA01-SS08-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS09-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS11-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS16-1108	07-Nov-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA01-SB01-1108	03-Nov-08	0.5	2	NA	NA
					CAA01-SB02-1108	03-Nov-08	0.5	2	NA	NA
					CAA01-SB02P-1108	03-Nov-08	0.5	2	NA	NA
					CAA01-SB03-1108	05-Nov-08	0.5	2	NA	NA
					CAA01-SB03-1208[2]	18-Dec-08	0.5	2	NA	NA
					CAA01-SB04-1108	03-Nov-08	0.5	2	NA	NA
					CAA01-SB05-1108	03-Nov-08	0.5	2	NA	NA
					CAA01-SB06-1108	04-Nov-08	0.5	2	NA	NA
					CAA01-SB06P-1108	04-Nov-08	0.5	2	NA	NA
					CAA01-SB07-1108	05-Nov-08	0.5	2	NA	NA
					CAA01-SB07-1208[2]	18-Dec-08	0.5	2	NA	NA
					CAA01-SB08-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB09-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB16-1108	07-Nov-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA01-DW01-1108	03-Nov-08	NA	NA	4	8
					CAA01-DW02-1108	03-Nov-08	NA	NA	9	13
					CAA01-DW03-1108	04-Nov-08	NA	NA	32	26

TABLE 2-1

AOC Sample Summary

Site Inspection for CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site	Subarea	Investigation	Media Sampled	Analytes	Sample Identification	Date Sampled	Top Sample Collection Depth (ft bgs)	Bottom Sample Collection Depth (ft bgs)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
AOC 1 - Scrap Metal Dump (Con't)	South	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA01-SS10-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS12-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS13-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS14-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS15-1108	07-Nov-08	0	0.5	NA	NA
					CAA01-SS17-1208	18-Dec-08	0	0.5	NA	NA
					CAA01-SS18-1208	18-Dec-08	0	0.5	NA	NA
					CAA01-SS18P-1208[1]	18-Dec-08	0	0.5	NA	NA
					CAA01-SS19-1208	17-Dec-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA01-SB10-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB12-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB13-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB14-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB15-1108	07-Nov-08	0.5	2	NA	NA
					CAA01-SB17-1208	18-Dec-08	0.5	2	NA	NA
					CAA01-SB18-1208	18-Dec-08	0.5	2	NA	NA
					CAA01-SB18P-1208[1]	18-Dec-08	0.5	2	NA	NA
					CAA01-SB19-1208	17-Dec-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA01-DW04-1108	05-Nov-08	NA	NA	28	32
					CAA01-DW04P-1108[1]	05-Nov-08	NA	NA	28	32
					CAA01-DW05-1208	18-Dec-08	NA	NA	5	9
					CAA01-DW05P-1208[1]	18-Dec-08	NA	NA	5	9
					CAA01-DW06-1208	18-Dec-08	NA	NA	4	8
					CAA01-DW07-1208	19-Dec-08	NA	NA	5	9
AOC 2 - Dextrose Dump	Area west of Dextrose Bottle Area	Field Investigation - Site 1 and AOC 2 (Baker, 1999)	SS	TCL organics, explosives, TAL inorganics, cyanide	CAA02-A2-DPB03-00-1098	22-Oct-98	0	0.5	NA	NA
			SB	TCL organics, explosives, TAL inorganics, cyanide	CAA02-A2-DPB03-03-1098	22-Oct-98	6	8	NA	NA
					CAA02-A2-DPB03-09-1098	22-Oct-98	18	20	NA	NA
			GW	TCL organics, explosives, TAL inorganics (filtered and unfiltered), cyanide	CAA02-A2DPW03-1098	22-Oct-98	NA	NA	(not available)	(not available)
					CAA02-A2DPW03P-1098	22-Oct-98	NA	NA	(not available)	(not available)
	Dextrose Bottle Area	Field Investigation - Site 1 and AOC 2 (Baker, 1999)	SS	TCL organics, explosives, TAL inorganics, cyanide	CAA02-A2-DPB02-00-1098	22-Oct-98	0	0.5	NA	NA
					CAA02-A2-HA01-00-1098	22-Oct-98	0	0.5	NA	NA
					CAA02-A2-HA01-00D-1098[1]	22-Oct-98	0	0.5	NA	NA
			SB	TCL organics, explosives, TAL inorganics, cyanide	CAA02-A2-DPB02-03-1098	22-Oct-98	6	8	NA	NA
					CAA02-A2-DPB02-10-1098	22-Oct-98	20	22	NA	NA
					CAA02-A2-HA01-02-1098	22-Oct-98	1	2	NA	NA
					CAA02-A2-HA01-02D-1098[1]	22-Oct-98	1	2	NA	NA
			GW	TCL organics, explosives, TAL inorganics (filtered and unfiltered), cyanide	CAA02-A2DPW02-1098	22-Oct-98	NA	NA	(not available)	(not available)
					CAA02-A2DPW04-1098	22-Oct-98	NA	NA	(not available)	(not available)
	Dextrose Bottle Area (soil within debris zone of test pit)	Field Investigation - Site 7 and AOC 2 (Baker, 2001)	SB	TCL organics, TAL inorganics and cyanide	CAA02-A2-TP03-F-1199[3]	12-Nov-99	2	3	NA	NA
					CAA02-A2-TP04-F-1199[3]	12-Nov-99	2.5	3	NA	NA
					CAA02-A2-TP05-F-1199[3]	12-Nov-99	1.5	2	NA	NA
					CAA02-A2-TP06-F-1199[3]	12-Nov-99	2	2.5	NA	NA

TABLE 2-1

AOC Sample Summary

Site Inspection for CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site	Subarea	Investigation	Media Sampled	Analytes	Sample Identification	Date Sampled	Top Sample Collection Depth (ft bgs)	Bottom Sample Collection Depth (ft bgs)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
AOC 2 - Dextrose Dump (Con't)	Dextrose Bottle Area (Native soil underlying debris in test pit)	Field Investigation - Site 7 and AOC 2 (Baker, 2001)	SB	TCL organics, TAL inorganics and cyanide	CAA02-A2-TP03-N-1199[4]	12-Nov-99	3.5	4	NA	NA
					CAA02-A2-TP04-N-1199[4]	12-Nov-99	3.5	4	NA	NA
					CAA02-A2-TP05-N-1199[4]	12-Nov-99	3.75	4	NA	NA
					CAA02-A2-TP05-ND-1199[1,4]	12-Nov-99	3.75	4	NA	NA
					CAA02-A2-TP06-N-1199[4]	12-Nov-99	3.5	4	NA	NA
	Drums and Filter Canisters Area	Field Investigation - Site 1 and AOC 2 (Baker, 1999)	SS	TCL organics, explosives, TAL inorganics, cyanide	CAA02-A2-DPB01-00-1098	22-Oct-98	0	0.5	NA	NA
					CAA02-A2-DPB04-00-1098	22-Oct-98	0	0.5	NA	NA
					CAA02-A2-HA02-00-1098	22-Oct-98	0	0.5	NA	NA
			SB	TCL organics, explosives, TAL inorganics, cyanide	CAA02-A2-DPB04-03-1098	23-Oct-98	6	8	NA	NA
					CAA02-A2-DPB04-09-1098	23-Oct-98	18	20	NA	NA
					CAA02-A2-DPB01-03-1098	22-Oct-98	6	8	NA	NA
					CAA02-A2-DPB01-15-1098	22-Oct-98	30	32	NA	NA
					CAA02-A2-HA02-01-1098	22-Oct-98	0.5	1	NA	NA
			GW	TCL organics, explosives, TAL inorganics (filtered and unfiltered), cyanide	CAA02-A2DPW01-1098	22-Oct-98	NA	NA	(not available)	(not available)
	Drums and Filter Canisters Area (soil within debris zone of test pit)	Field Investigation - Site 7 and AOC 2 (Baker, 2001)	SB	TCL organics, TAL inorganics and cyanide *(Note: sample CAA02-A2-TP01-F-1199 analyzed for TCL VOCs only)*	CAA02-A2-TP01-F-1199[3]	12-Nov-99	3.5	4	NA	NA
					CAA02-A2-TP01-FD-1199[1,3]	12-Nov-99	3.5	4	NA	NA
					CAA02-A2-TP01-F1-1199[3]	12-Nov-99	3.5	4	NA	NA
					CAA02-A2-TP02-F-1199[3]	12-Nov-99	3.5	4	NA	NA
	Drums and Filter Canisters Area (Native soil underlying debris in test pit)	Field Investigation - Site 7 and AOC 2 (Baker, 2001)	SB	TCL organics, TAL inorganics and cyanide	CAA02-A2-TP01-N-1199[4]	12-Nov-99	4.8	5.4	NA	NA
					CAA02-A2-TP02-N-1199[4]	12-Nov-99	6	7	NA	NA
AOC 6 - Penniman AOC	1918 Drum Storage Area	2008 CAX AOCs SI	SS	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA06-SS14-1108	11-Nov-08	0	0.5	NA	NA
					CAA06-SS15-1108	11-Nov-08	0	0.5	NA	NA
					CAA06-SS16-1108	11-Nov-08	0	0.5	NA	NA
					CAA06-SS17-1108	11-Nov-08	0	0.5	NA	NA
					CAA06-SS18-1108	11-Nov-08	0	0.5	NA	NA
					CAA06-SS19-1108	11-Nov-08	0	0.5	NA	NA
					CAA06-SS19P-1108[1]	11-Nov-08	0	0.5	NA	NA
			SB	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA06-SB14-1108	11-Nov-08	0.5	2	NA	NA
					CAA06-SB15-1108	11-Nov-08	0.5	2	NA	NA
					CAA06-SB16-1108	11-Nov-08	0.5	2	NA	NA
					CAA06-SB17-1108	11-Nov-08	0.5	2	NA	NA
					CAA06-SB18-1108	11-Nov-08	0.5	2	NA	NA
					CAA06-SB19-1108	11-Nov-08	0.5	2	NA	NA
					CAA06-SB19P-1108[1]	11-Nov-08	0.5	2	NA	NA
			GW	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA06-DW09-1108	11-Nov-08	NA	NA	11	15
					CAA06-DW10-1108	11-Nov-08	NA	NA	10.5	14.5
					CAA06-DW10P-1108[1]	11-Nov-08	NA	NA	10.5	14.5
					CAA06-DW11-1108	11-Nov-08	NA	NA	10	14

TABLE 2-1

AOC Sample Summary

Site Inspection for CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site	Subarea	Investigation	Media Sampled	Analytes	Sample Identification	Date Sampled	Top Sample Collection Depth (ft bgs)	Bottom Sample Collection Depth (ft bgs)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
AOC 6 - Penniman AOC (Con't)	Ammonia Settling Pits	2008 CAX AOCs SI	SS	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA06-SS05-1008	21-Oct-08	0	0.5	NA	NA
					CAA06-SS06-1008	21-Oct-08	0	0.5	NA	NA
					CAA06-SS06P-1008[1]	21-Oct-08	0	0.5	NA	NA
					CAA06-SS10-1108	06-Nov-08	0	0.5	NA	NA
					CAA06-SS11-1108	06-Nov-08	0	0.5	NA	NA
					CAA06-SS12-1108	06-Nov-08	0	0.5	NA	NA
			SB	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA06-SB05-1008	21-Oct-08	0.5	2	NA	NA
					CAA06-SB06-1008	21-Oct-08	0.5	2	NA	NA
					CAA06-SB06P-1008[1]	21-Oct-08	0.5	2	NA	NA
					CAA06-SB10-1108	06-Nov-08	0.5	2	NA	NA
					CAA06-SB11-1108	06-Nov-08	0.5	2	NA	NA
					CAA06-SB12-1108	06-Nov-08	0.5	2	NA	NA
			GW	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA06-DW02-1108	06-Nov-08	NA	NA	10	14
					CAA06-DW03-1108	06-Nov-08	NA	NA	8	12
					CAA06-DW04-1108	06-Nov-08	NA	NA	10	14
					CAA06-DW04P-1108[1]	06-Nov-08	NA	NA	10	14
			SW	TCL SVOCs, TAL inorganics/cyanide (total and dissolved), explosives, nitroglycerin, nitroguanadine, hardness	CAA06-SW02-1008	23-Oct-08	NA	NA	NA	NA
			SD	TCL SVOCs, TAL inorganics/cyanide (total and dissolved), explosives, nitroglycerin, nitroguanadine, TOC, pH, grain size, AVS/SEM	CAA06-SD02-1008	23-Oct-08	0	4 inches bgs	NA	NA
			SSD	TCL SVOCs, TAL inorganics/cyanide (total and dissolved), explosives, nitroglycerin, nitroguanadine, TOC, pH, grain size, AVS/SEM	CAA06-SSD02-1008	23-Oct-08	4 inches bgs	8 inches bgs	NA	NA
	TNT Graining House Sump and Catch Boxes	2008 CAX AOCs SI	SS	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA06-SS01-1008	20-Oct-08	0	0.5	NA	NA
					CAA06-SS02-1008	21-Oct-08	0	0.5	NA	NA
					CAA06-SS03-1008	21-Oct-08	0	0.5	NA	NA
					CAA06-SS04-1008	21-Oct-08	0	0.5	NA	NA
					CAA06-SS07-1108	05-Nov-08	0	0.5	NA	NA
					CAA06-SS08-1108	06-Nov-08	0	0.5	NA	NA
					CAA06-SS13-1108	06-Nov-08	0	0.5	NA	NA
			SB	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA06-SB01-1008	20-Oct-08	0.5	2	NA	NA
					CAA06-SB02-1008	21-Oct-08	0.5	2	NA	NA
					CAA06-SB03-1008	21-Oct-08	0.5	2	NA	NA
					CAA06-SB04-1008	21-Oct-08	0.5	2	NA	NA
					CAA06-SB07-1108	05-Nov-08	0.5	2	NA	NA
					CAA06-SB08-1108	06-Nov-08	0.5	2	NA	NA
					CAA06-SB13-1108	06-Nov-08	0.5	2	NA	NA
			GW	TCL SVOCs, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA06-DW01-1108	05-Nov-08	NA	NA	10	14
					CAA06-DW06-1108	10-Nov-08	NA	NA	8	12
					CAA06-DW07-1108	10-Nov-08	NA	NA	9	13
					CAA06-DW08-1108	10-Nov-08	NA	NA	9.5	13.5
			SW	TCL SVOCs, TAL inorganics/cyanide (total and dissolved), explosives, nitroglycerin, nitroguanadine, hardness	CAA06-SW01-1008	23-Oct-08	NA	NA	NA	NA
					CAA06-SW01P-1008[1]	23-Oct-08	NA	NA	NA	NA
			SD	TCL SVOCs, TAL inorganics/cyanide (total and dissolved), explosives, nitroglycerin, nitroguanadine, TOC, pH, grain size, AVS/SEM	CAA06-SD01-1008	23-Oct-08	0	4 inches bgs	NA	NA
					CAA06-SD01P-1008[1]	23-Oct-08	0	4 inches bgs	NA	NA
			SSD	TCL SVOCs, TAL inorganics/cyanide (total and dissolved), explosives, nitroglycerin, nitroguanadine, TOC, pH, grain size, AVS/SEM	CAA06-SSD01-1008	23-Oct-08	4 inches bgs	8 inches bgs	NA	NA

TABLE 2-1

AOC Sample Summary

Site Inspection for CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site	Subarea	Investigation	Media Sampled	Analytes	Sample Identification	Date Sampled	Top Sample Collection Depth (ft bgs)	Bottom Sample Collection Depth (ft bgs)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
AOC 7 - Drum and Can Disposal Area	Drum Disposal Area	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SS03-1008	29-Oct-08	0	0.5	NA	NA
					CAA07-SS03P-1008[1]	29-Oct-08	0	0.5	NA	NA
					CAA07-SS06-1008	31-Oct-08	0	0.5	NA	NA
					CAA07-SS07-1008	31-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SB03-1008	29-Oct-08	0.5	2	NA	NA
					CAA07-SB03P-1008[1]	29-Oct-08	0.5	2	NA	NA
					CAA07-SB06-1008	31-Oct-08	0.5	2	NA	NA
					CAA07-SBTP06-1008	31-Oct-08	10	10	NA	NA
					CAA07-SB07-1008	31-Oct-08	0.5	2	NA	NA
					CAA07-SBTP05-1008	31-Oct-08	10	10	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA07-DW03-1008	30-Oct-08	NA	NA	17.5	21.5
					CAA07-DW03P-1008[1]	30-Oct-08	NA	NA	17.5	21.5
	Drum Disposal Area (downgradient)	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SS04-1008	30-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SB04-1008	30-Oct-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA07-DW04-1008	31-Oct-08	NA	NA	9	13
	Can Pit	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SS02-1008	29-Oct-08	0	0.5	NA	NA
					CAA07-SS05-1008	30-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SB02-1008	29-Oct-08	14	16	NA	NA
					CAA07-SB05-1008	30-Oct-08	0.5	2	NA	NA
					CAA07-SBTP04-1008	30-Oct-08	10	10	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA07-DW02-1008	30-Oct-08	NA	NA	20	24
	Can Pit (upgradient)	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SS01-1008	29-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA07-SB01-1008	29-Oct-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA07-DW01-1008	30-Oct-08	NA	NA	19	23

TABLE 2-1

AOC Sample Summary

Site Inspection for CAX AOCs 1, 2, 6, 7, and 8

Cheatham Annex, Williamsburg, Virginia

Site	Subarea	Investigation	Media Sampled	Analytes	Sample Identification	Date Sampled	Top Sample Collection Depth (ft bgs)	Bottom Sample Collection Depth (ft bgs)	Top of Screened Interval (ft bgs)	Bottom of Screened Interval (ft bgs)
AOC 8 - Area South of Site 7	(site)	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA08-SS01-1008	22-Oct-08	0	0.5	NA	NA
					CAA08-SS02-1008	22-Oct-08	0	0.5	NA	NA
					CAA08-SS03-1008	22-Oct-08	0	0.5	NA	NA
					CAA08-SS04-1008	24-Oct-08	0	0.5	NA	NA
					CAA08-SS05-1008	24-Oct-08	0	0.5	NA	NA
					CAA08-SS07-1008	27-Oct-08	0	0.5	NA	NA
					CAA08-SS08-1008	28-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA08-SB01-1008	22-Oct-08	0.5	2	NA	NA
					CAA08-SBTP24-1008	27-Oct-08	20	20	NA	NA
					CAA08-SB02-1008	22-Oct-08	0.5	2	NA	NA
					CAA08-SB03-1008	22-Oct-08	0.5	2	NA	NA
					CAA08-SB04-1008	24-Oct-08	0.5	2	NA	NA
					CAA08-SBTP14-1008	23-Oct-08	20	20	NA	NA
					CAA08-SB05-1008	24-Oct-08	0.5	2	NA	NA
					CAA08-SBTP19-1008	24-Oct-08	20	20	NA	NA
					CAA08-SB07-1008	27-Oct-08	0.5	2	NA	NA
					CAA08-SB08-1008	28-Oct-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA08-DW02-1008	28-Oct-08	NA	NA	10	14
					CAA08-DW03-1008	27-Oct-08	NA	NA	9	13
	(downgradient)	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA08-SS06-1008	27-Oct-08	0	0.5	NA	NA
					CAA08-SS06P-1008[1]	27-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA08-SB06-1008	27-Oct-08	0.5	2	NA	NA
					CAA08-SB06P-1008[1]	27-Oct-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA08-DW04-1008	27-Oct-08	NA	NA	5	9
					CAA08-DW04P-1008[1]	27-Oct-08	NA	NA	5	9
	(upgradient)	2008 CAX AOCs SI	SS	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA08-SS09-1008	28-Oct-08	0	0.5	NA	NA
					CAA08-SS09P-1008[1]	28-Oct-08	0	0.5	NA	NA
			SB	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide, TOC, pH	CAA08-SB09-1008	28-Oct-08	0.5	2	NA	NA
					CAA08-SB09P-1008[1]	28-Oct-08	0.5	2	NA	NA
			GW	TCL organics, explosives, nitroglycerin, nitroguanadine, TAL inorganics/cyanide (total and dissolved)	CAA08-DW01-1008	28-Oct-08	NA	NA	16	20

Notes:

[1]Duplicate sample

[2]Sample recollected for analysis of pesticides/PCBs since lab inadvertently neglected to conduct these analyses for the November 2008 sample

[3]Sample collected from fill zone

[4]Native soil sample

NA - Not applicable

SS - surface soil

SB - subsurface soil

GW - groundwater

SD - sediment

bgs - below ground surface

TABLE 2-2

Summary of Final Water Indicator Parameters Prior to Groundwater Sample Collection

DPT GW Sampling Fall 2008

Cheatham Annex, Williamsburg, Virginia

AOC	DPT Location	Field Parameter								
		DTW	Screen Interval	pH	Specific Conductance (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temperature (°C)	Salinity (%)	ORP (mV)
AOC 1	AOC1-DW01	4'	4'-9'	5.91	0.682	747.0	3.92	16.51	0.03	+168
AOC 1	AOC1-DW02	9'	9'-13'	5.74	0.888	301.0	0.65	17.11	0.04	-323
AOC 1	AOC1-DW03	32'	32'-36'	5.91	0.720	ERR	0.46	18.24	0.03	-554
AOC 1	AOC1-DW04	28'	28'-32'	5.11	8.771	ERR	0.69	18.17	0.04	-492
AOC 1	AOC1-DW05	5'	0'-6'	6.96	ERR	ERR	11.13	10.22	0.04	-77
AOC 1	AOC1-DW06	4'	0'-6'	10.45	ERR	68.2	10.20	11.31	0.01	-123
AOC 1	AOC1-DW07	5'	0'-7'	7.26	0.722	8.0	2.65	12.29	0.03	-93
AOC 6	AOC6-DW01	9.5'	10'-14'	5.88	0.408	702.0	0.70	18.05	0.02	-297
AOC 6	AOC6-DW02	11'	10'-14'	5.55	0.457	ERR	0.66	18.96	0.02	-403
AOC 6	AOC6-DW03	8'	7'-11'	5.36	0.438	254.0	0.71	19.27	0.02	-253
AOC 6	AOC6-DW04	10'	10'-14'	4.96	0.349	ERR	3.72	17.98	0.01	-89
AOC 6	AOC6-DW05	10'	9'-13'	6.86	0.444	ERR	0.03	17.54	0.02	-388
AOC 6	AOC6-DW06	~8'	8'-12'	6.85	0.404	ERR	0.00	19.46	0.02	-208
AOC 6	AOC6-DW07	9'	9'-13'	7.11	0.522	ERR	0.01	18.52	0.02	-231
AOC 6	AOC6-DW08	9.5'	10'-14'	7.00	0.457	921.0	0.00	18.85	0.02	-176
AOC 6	AOC6-DW09	11'	11'-15'	6.71	0.998	ERR	0.00	18.13	0.05	-78
AOC 6	AOC6-DW10	~10.5'	11'-15'	6.86	0.853	ERR	0.01	19.10	0.04	+13
AOC 6	AOC6-DW11	~10'	11-15'	6.80	0.685	ERR	0.02	17.89	0.03	-94
AOC 7	AOC7-DW01	19'	19'-23'	6.20	0.608	ERR	0.83	15.91	0.03	-499
AOC 7	AOC7-DW02	20'	20'-24'	6.10	0.698	630.0	6.30	16.13	0.03	+131
AOC 7	AOC7-DW03	~17.5'	18'-22'	6.13	0.690	ERR	6.49	16.04	0.03	+111
AOC 7	AOC7-DW04	9'	9'-13'	5.60	0.585	229.0	1.64	16.44	0.02	+58
AOC 8	AOC8-DW01	~15.5'	16'-20'	5.78	0.536	ERR	5.28	18.13	0.02	+98
AOC 8	AOC8-DW02	~9.5'	10'-14'	6.10	0.482	ERR	1.15	16.92	0.02	-227
AOC 8	AOC8-DW03	9'	9'-13'	5.96	0.486	ERR	0.95	18.30	0.02	-457
AOC 8	AOC8-DW04	5'	5'-9'	6.08	0.584	660.0	0.87	17.42	0.02	-115

Notes

[1]Instrument error is assumed
DTW- Depth to Water
Specific conductance is the electrical conductivity value standardized to 25°C (degrees Celsius)
mS/cm - millisiemens per centimeter; 1 siemen = 1/ohm = mho.
NTU - Nephelometric Turbidity Units
DO - Dissolved Oxygen
mg/L - milligrams per liter
°C - degrees Celsius
ORP - Oxidation-Reduction Potential
mV - millivolts
ERR - Instrument error; turbidity likely >999

SECTION 3

AOC 1—Scrap Metal Dump

This section presents an evaluation of the results from the SI performed at AOC 1. The section includes a summary of the previous investigations conducted at the site, the CSM, and the release assessment decision analysis.

3.1 History of Investigation

The following investigations were previously conducted and documented at AOC 1:

- Final Site Inspection Narrative Report, Penniman Shell Loading Plant, Williamsburg, Virginia (Weston, 1999a)
- Final Site Inspection Report, Site 4 and AOC 1, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Annex Site (Baker, 2001a)

3.2 Conceptual Site Model

The CSM for AOC 1 is based on the data collected as part of the previous investigations and the current SI. The CSM interprets the physical characteristics, the distribution of contamination and potential contaminant source, potential migration pathways, and the potential exposure and receptor pathways. The CSM for AOC 1 is shown in **Figure 3-1**.

3.2.1 Site History and Potential Sources of Release

AOC 1 is a debris disposal area located just west of Chapman Road comprised of two ravines (north and south) associated with unnamed tributaries to Jones Pond (**Figure 3-2**). This site was identified as an AOC in 1998, following site visits by the Navy, USEPA, and VDEQ. The ravines themselves are separated by approximately 360 linear feet of high ground with no debris in between. Therefore, AOC 1 was divided into two distinct areas - North and South – and each evaluated separately. AOC 1 North is approximately 0.2 acre in size while AOC 1 South is about 0.4 acre in size; both areas are wooded. Wood and metal debris outcrop from the banks of the ravines, with debris being more extensive within AOC 1 South. Debris observed during the 1998 site visits also included two corroded cylinders, approximately 8 inches in diameter and 54-inches long, located along the top of a bank within AOC 1 North. These cylinders, which were determined to be empty, were labeled "The Liquid Carbonic Co" and were removed from the site in April 2000 by IMS Environmental Services. The date(s) of debris disposal at AOC 1 are unknown; however, it is possible some of this debris dates back to WWI (Weston, 1999a). The total volume of debris at AOC 1 is estimated to be 3,000 cubic yards (yd^3) (Baker, 2001a).

Aerial Photograph Review

Aerial photographs from 1937, 1942, 1955, 1963, 1975, and 1998 were reviewed to determine historical activity at AOC 1 (**Appendix F**). Analysis of aerial photographs from 1937, 1942, 1955, 1963, 1975, and 1988 indicates the following:

- **1937 (Appendix F, Figure F-1)**—AOC 1 appears entirely wooded/vegetated.
- **1942 (Appendix F, Figure F-2)**—AOC 1 North and AOC 1 South appear disturbed (the entire area appears as a ground scarp).
- **1955 (Appendix F, Figure F-3)**—AOC 1 North is mostly truncated in this photograph. The western portion of the AOC 1 South appears vegetated and the eastern portion is slightly disturbed.
- **1963 (Appendix F, Figure F-4)**—The southern area of AOC 2 appears partially disturbed. AOC 1 North is identified in the aerial photograph as "mounded material [extensive]" and "fill (FL)." This "mounded material" extends just south of the area identified as AOC 1 North and appears to lie in the ravine separating AOC 1 North and AOC 1 South.
- 1975 (**Appendix F, Figure F-5**) and 1998 (**Appendix F, Figure F-6**)—AOC 1 appears wooded/vegetated.

1999 Former Penniman Shell Loading Plant Site Inspection

In 1999, an SI was conducted to assess potential sources of contamination associated with the former PSLP, to determine the need for additional investigation, and if appropriate, to support site evaluation for proposal to the NPL. Of the 29 samples collected from potential source areas associated with the former PSLP, two sediment samples were collected within the vicinity of AOC 1 (referred to as the Jones Pond Landfill in the Final SI Narrative Report [Weston, 1999a]). The sediment samples were collected from drainage channels leading to Jones Mill Pond within the vicinity of AOC 1 North and AOC 1 South.

Only analytical data for one of the two sediment samples was provided in the Final SI Narrative Report (Weston, 1999a). The concentration of manganese in this sample (168 milligrams per kilogram [mg/kg]) was above the detected concentration in the sediment sample collected to represent background (20.8 mg/kg). Therefore, it was recommended that a more specific investigation be conducted of the Jones Mill Pond Landfill area.

1999 AOC 1 Site Inspection

Another SI was conducted at AOC 1 in 1999, which included a geophysical survey and soil and surface water/sediment sampling (Baker, 2001a).

During the 1999 SI, debris, including scrap metal, wood, empty drums, cinder blocks, bricks, wood, and concrete and concrete slabs, was observed to have been disposed in the two ravines located in the northern and southern areas of AOC 1. The debris areas in both AOC 1 North and AOC 1 South, as defined by the geophysical survey, are roughly coincident with the extent of debris that is present at the surface. At AOC 1 North, the eastern (buried) edge of debris is interpreted to be approximately 10 to 12 feet beyond the edge of the surface debris (i.e., unexposed debris is buried within an approximately 10- to 12-foot wide area). With the exception of this 10- to 12-foot wide area, the results of the survey indicate that there is not extensive buried debris at AOC 1 (Baker, 2001a).

All of the 1999 SI samples were analyzed for Target Compound List (TCL) organics, Target Analyte List (TAL) inorganics, cyanide, and nitramines/nitroaromatics (explosives). Summaries of these detections are included in **Tables G-1 through G-4 in Appendix G**. Total PAHs (~5,000 micrograms per kilogram [µg/kg]) and arsenic (23.5 mg/kg) were detected in soil, with the highest concentrations in AOC 1 North. Only low estimated levels of phthalates were detected in surface water and sediment. Arsenic (7.4 mg/kg) and low estimated levels below reporting limits of ethylbenzene and xylene were also detected in sediment.

2008 Site Inspection Activities

AOC 1 investigation activities included surface soil, subsurface soil, and groundwater sampling. An explanation for each activity and methods of sample collection are documented in Section 2.

3.2.2 Physical Setting

Topography and Surface Water

The topography of AOC 1 is characterized by two ravines, each associated with an unnamed tributary (**Figure 3-3**). These two tributaries merge just west of AOC 1, where runoff from AOC 1 flows approximately 1,000 feet west toward Jones Mill Pond (**Figure 3-1**), a former source of potable water for CAX (Weston, 1999a).

Hydrogeology

In general, soil ranges from predominantly silt and clay at AOC 1 North to clay and sand at AOC 1 South. Soil boring logs from the SI field activities present descriptions of the soil and general subsurface geology and are included in **Appendix C**.

The first encountered groundwater underlying AOC 1 is the Cornwallis Cave Aquifer and was first encountered from 4 to 32 and 4 to 28 feet bgs at AOC 1 North and AOC 1 South, respectively. Groundwater is expected to flow west toward Jones Mill Pond, which is the nearest open-water body to AOC 1.

Current and Future Land Use

AOC 1 is currently restricted to the general public by a locked chain-link fence; however, it is unrestricted to Navy personnel who use Jones Mill Pond for recreation, hiking, and fishing (Weston, 1999a). Future land use at AOC 1 is not expected to change and will likely continue as recreational for the foreseeable future.

3.2.3 Distribution of Contamination

Data collected during the 2008 SI field activities were evaluated as part of this SI report (**Figure 3-3**). **Tables 3-1** to **3-3** and **Tables 3-4** to **3-6** summarize all constituents detected in soil and groundwater at AOC 1 North and South, respectively. With the exception of arsenic (7.4 mg/kg) in sediment, only low, estimated levels of phthalates, ethylbenzene and xylenes near reporting limits were detected in historical surface water and sediment samples (**Tables G-3** and **G-4 in Appendix G**). Therefore, no sediment or surface water samples were collected for this SI. The tables also identify screening criteria exceedances. All analytical data for the SI samples are provided in **Appendix H**.

AOC 1 North

Surface Debris

During the SI field activities, debris observed at AOC 1 North included wood debris (former railroad ties); one 55-gallon empty, rusted drum; a concrete channel that formed via the disposal of wet, concrete waste that cured in place, mimicking the ground/terrain form; and sporadic, small areas of metal debris. Soil and groundwater sample locations were located immediately adjacent to and on the expected downgradient side of the observed debris in order to identify those areas with the highest potential for contamination. The type and location of debris observed within the vicinity of the SI sample locations are provided in **Figure 3-4**.

Soil

A total of 11 surface (0-6 inches) and 10 shallow subsurface (6-24 inches) soil samples were collected from AOC 1 North (**Figure 3-3**) as part of the 2008 SI field activities. The soil sample locations were positioned in areas with the greatest potential for contamination (in areas where debris was observed), and in potential migration pathways (based on site-specific topographic and hydrologic conditions). Additionally, soil samples were collected from locations expected to be upgradient from AOC 1 North and South, in areas assumed to be unaffected by site conditions. Concrete present at AOC 1 North could not be penetrated by hand auger or backhoe, so a subsurface sample was not collected at one location (SO11). Samples SO03 and SO07 were recollected and submitted for analysis of pesticides/PCBs, as the laboratory inadvertently missed these analyses during the initial run.

Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine), TOC, and pH. The soil analytical results are listed in **Tables 3-1 and 3-2**, and the exceedances are shown on **Figures 3-5 and 3-6**.

VOCs, SVOCs, Pesticides, PCBs, and Explosives

Five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and ideno(1,2,3-cd)pyrene) and two pesticides (endrin and endrin aldehyde) were detected above screening criteria in surface soil (**Figure 3-5**). No VOCs, PCBs, or explosives were detected above screening criteria in surface soil (**Table 3-1**), and no VOCs, SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in subsurface soil (**Table 3-2**).

- SVOC concentrations were detected within a localized area in the northeast portion of the site (SS04, SS05, and SS11). The maximum SVOC concentrations were detected in one surface soil, SS11, collected from a depositional area and downhill from two piles of railroad ties. The maximum detected concentrations of benzo(a)anthracene (370L µg/kg) and ideno(1,2,3-cd)pyrene (750L µg/kg) exceeded their respective residential RSLs (150 µg/kg for both). In addition, the maximum detected concentrations of benzo(a)pyrene (750L µg/kg), benzo(b)fluoranthene (2,400L µg/kg), dibenz(a,h)anthracene (330L µg/kg) exceeded their respective industrial RSLs (210 µg/kg, 2,100 µg/kg, and 210 µg/kg, respectively).

- Two pesticides were observed slightly above the ecological screening value in two surface soil samples (SS05 and SS11), with the highest detections in surface soil sample, SS11 [endrin (3.3J µg/kg) and endrin aldehyde (3.1J µg/kg)] (**Figure 3-5**). These samples were collected within a localized area in the northeastern portion of the site. Pesticides were not known to be disposed at AOC 1. The low detected concentrations (all less than 50 µg/kg) are likely attributable to normal pesticide use applied to soil at United States Department of Defense (DoD) facilities to control pests and weeds. The legal application of pesticides is not identified as a CERCLA-related release and is, therefore, not subject to regulation under CERCLA.

Inorganic Constituents

Nine inorganics (aluminum, arsenic, chromium, cyanide, lead, manganese, mercury, vanadium, and zinc) exceeded at least one screening criterion in surface soil (**Figure 3-5**).

- Aluminum, arsenic, chromium, lead, manganese, mercury, vanadium, and zinc exceeded their respective base background UTLs (12,200, 6.36, 18.2, 17.4, 324, 0.111, 27.9, and 26.5 mg/kg, respectively) at maximum concentrations of 18,200, 47.5 L, 48.7, 121, 426, 0.15, 40.8, and 872 mg/kg, respectively.
- Cyanide was detected in only one sample (SS04) at a concentration of 29 mg/kg. No base background UTL is available for this constituent.

Three inorganics (aluminum, arsenic, and cobalt) exceeded at least one screening criterion in subsurface soil (**Figure 3-6**). Aluminum and arsenic are commonly associated with volcanic-derived sediment and from weathered clay and can be variable across a site.

- Aluminum and arsenic exceeded their respective base background UTLs (13,000 and 5.5 mg/kg, respectively) with maximum concentrations of 19,200 and 6.8 mg/kg, respectively.
- The maximum cobalt concentration (8.4J mg/kg) slightly exceeded its base background UTL (5.2 mg/kg) and is likely attributable to natural background conditions.

Groundwater

Groundwater samples were collected from three DPT locations (DW01 through DW03) at AOC 1 North (**Table 3-3**). One sample (DW03) was collected from a location expected to be upgradient from AOC 1 North, in an area assumed to be unaffected by site conditions. The remaining two locations were determined to accommodate site-specific topographic and hydrologic conditions, with a bias toward locations with the greatest potential for contamination as well as thorough spatial coverage.

Groundwater samples were submitted for analysis of VOCs, SVOCs, pesticides, PCBs, inorganics (total and dissolved) and cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine). Each of these samples was co-located with surface and subsurface soil samples. The groundwater analytical results are listed in **Table 3-3** and the exceedances are shown on **Figure 3-7**.

VOCs, SVOCs, Pesticides, PCBs, and Explosives

- No VOCs, SVOCs, pesticides, PCBs or explosives were detected at concentrations above screening criteria in groundwater (**Table 3-3**).

Inorganic Constituents

Sixteen total inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc) and five dissolved inorganics (aluminum, arsenic, cobalt, iron, and manganese) exceeded at least one screening criterion in groundwater (**Figure 3-7**). Dissolved inorganics data are likely more representative of inorganic concentrations migrating in groundwater, since the DPT method generally results in higher total inorganic concentrations as a result of higher turbidity during sampling.

- The upgradient groundwater sample (DW03) had the most frequent inorganic constituents detected. However, only aluminum, arsenic, cobalt, iron, and manganese were detected in the dissolved phase at this

location. The maximum dissolved aluminum concentration (723 µg/L at location DW01) exceeded its base background UTL (100 µg/L).

AOC 1 South

Surface Debris

Debris observed at AOC 1 South consisted primarily of piles of concrete and metal debris and empty 55-gallon, rusted drums. Soil and sample locations were located immediately adjacent to and on the expected downgradient side of the observed debris in order to identify those areas with the highest potential for contamination. The type and location of debris observed within the vicinity of the SI sample locations are provided in **Figure 3-8**.

Soil

A total of eight surface (0-6 inches) and eight shallow subsurface (6-24 inches) soil samples were collected from AOC 1 South (**Table 2-1**) as part of the 2008 SI field activities. The soil sample locations were determined to accommodate site-specific topographic and hydrologic conditions, with a bias toward locations with the greatest potential for contamination as well as thorough spatial coverage. Additionally, soil samples were collected from locations expected to be upgradient from AOC 1 South, in areas assumed to be unaffected by site conditions.

Soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine), TOC, and pH. The soil analytical results are listed in **Tables 3-4 and 3-5**, and the exceedances are shown on **Figures 3-9 and 3-10**.

VOCs, SVOCs, Pesticides, PCBs, and Explosives

Five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and ideno(1,2,3-cd)pyrene) were detected above screening criteria in only one surface soil sample (SS15), located downgradient of concrete and metal debris (**Figures 3-8 and 3-9**). No VOCs, pesticides, PCBs, or explosives were detected at concentrations above screening criteria in surface soil (**Table 3-4**).

- The concentrations of benzo(a)anthracene (1,900L µg/kg), benzo(b)fluoranthene (1,400 µg/kg) and ideno(1,2,3-cd)pyrene (780 µg/kg) exceeded their respective residential RSLs (150 µg/kg for all three). The concentrations of benzo(a)pyrene (1,500 µg/kg) and dibenz(a,h)anthracene (270J µg/kg) exceeded their respective industrial RSLs (210 µg/kg for both).

Three SVOCs (benzo(a)pyrene, benzo(b)fluoranthene, and ideno(1,2,3-cd)pyrene) were detected above screening criteria in only one subsurface soil sample (SB17), located downgradient from metal debris (**Figure 3-10**). No VOCs, pesticides, PCBs, or explosives were detected at concentrations above screening criteria in subsurface soil (**Table 3-5**).

- The concentrations of benzo(b)fluoranthene (290J µg/kg) and ideno(1,2,3-cd)pyrene (270J µg/kg) exceeded their respective residential RSLs (150 µg/kg for both). The concentration of benzo(a)pyrene (220J µg/kg) exceeded its respective industrial RSL (210 µg/kg). SVOCs were not detected in groundwater.

Inorganic Constituents

Nine inorganics (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury, and zinc) exceeded at least one screening criterion in surface soil (**Figure 3-9**).

- Aluminum, arsenic, chromium, manganese, and mercury slightly exceeded their respective base background UTLs (12,200, 6.4, 18.2, 324, and 0.111 mg/kg, respectively) with maximum concentrations of 13,900, 21.8, 18.4, 394, and 0.14J mg/kg, respectively.
- Concentrations of copper, iron, lead, and zinc were detected in localized areas near metal debris (SS14 and SS15), except for SS18 where zinc was detected. The maximum concentrations of copper, iron, lead, and zinc (88.5, 32,300, 698, 477 mg/kg, respectively) exceeded their base background UTLs and a screening criterion. All of these concentrations were detected at one sample location, SS15, and may be attributable to surface debris, as this location is downgradient of a large metal debris pile (**Figure 3-8**).

Nine inorganics (aluminum, antimony, arsenic, cobalt, copper, iron, lead, manganese, and zinc) exceeded at least one screening criterion and their respective base background concentrations in subsurface soil (**Figure 3-10**).

- Aluminum exceeded its base background UTL (13,000 mg/kg) at a maximum concentration of 15,100 mg/kg at location SB10.
- The maximum concentrations of arsenic, cobalt, copper, iron, lead, and zinc (17.4, 7.3J, 105, 43,300, 3,360, and 1,130 mg/kg, respectively) exceeded base background UTLs and screening criteria. All of these concentrations were detected at one sample location, SB15, which is located downgradient of a large metal debris pile (**Figure 3-8**).

Groundwater

Groundwater samples were collected from four DPT locations (DW04 through DW07) at AOC 1 South (**Table 3-6**). One sample (DW04) was collected from a location expected to be upgradient from AOC 1 South, in an area assumed to be unaffected by site conditions. The remaining two locations were determined to accommodate site-specific topographic and hydrologic conditions, with a bias toward locations with the greatest potential for contamination as well as thorough spatial coverage.

Groundwater samples were submitted for analysis of VOCs, SVOCs, pesticides, PCBs, inorganics (total and dissolved) and cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine). Each of these samples was co-located with surface and subsurface soil samples. The groundwater analytical results are listed in **Table 3-6** and the exceedances are shown on **Figure 3-11**.

VOCs, SVOCs, Pesticides, PCBs, and Explosives

No VOCs, SVOCs, pesticides, PCBs or explosives were detected at concentrations above screening criteria in the groundwater samples (**Table 3-6**).

Inorganic Constituents

Thirteen total inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, vanadium, and zinc) and six dissolved inorganics (aluminum, arsenic, barium, iron, lead, and manganese) exceeded at least one screening criterion in groundwater (**Figure 3-11**).

- The upgradient groundwater sample (DW04) had the most frequent inorganic constituents detected above background concentrations and screening criteria. However, only aluminum, arsenic, iron, and manganese were detected in the dissolved phase. The maximum dissolved aluminum concentration (513 µg/L at DW06) exceeded its base background UTL (100 µg/L) and ecological screening criterion (87 µg/L).

3.2.4 Potential Exposure and Receptor Pathways

Potential receptors at AOC 1 include both human health and ecological: current/future recreational users/visitors, trespassers, maintenance workers, and industrial workers; future residents and construction workers; and lower trophic level terrestrial receptors (plants and soil invertebrates).

Human Health Risk Evaluation

The Human Health Risk Screening (HHRS) evaluation for AOC 1 is presented in **Appendix A**. The evaluation was conducted in three steps using a risk ratio technique (Navy, 2000). The supporting tables for the evaluation are presented in **Appendix A**, **Attachment A.1**. An overview of the various potential receptors and exposure pathways at the site is presented in **Figure A-1** of **Appendix A**. The results of the evaluation for AOC 1 are summarized as follows.

AOC 1 North

Surface Soil

The risk-based screening for surface soil at AOC 1 North is provided in **Appendix A**, **Attachment A.1**, **Tables 2.1** through **2.1b**.

- In Step 1, ten constituents were detected in surface soil samples above background concentrations (for inorganics) and the human health screening levels, and were selected as constituents of potential concern (COPCs) – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, aluminum, arsenic, chromium, manganese, and vanadium.
- In Step 2, based on the maximum detected concentration of each COPC, a cumulative cancer risk of 4×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ hazard indices (HIs) calculated for the COPCs ranged from 0.2 to 0.5; these HI values do not exceed the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk were identified as COPCs and include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, and chromium.
- In Step 3, based on the use of the 95 percent UCL for the exposure point concentrations (EPC), a cumulative cancer risk of 3×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Constituents contributing to the cumulative cancer risk were identified as COPCs and include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, and chromium. Arsenic and chromium each contribute individual cancer risks above 5×10^{-5}, and the cumulative cancer risk associated with exposure to all of the PAHs is also above 5×10^{-5}.

Exposure to surface soil at AOC 1 North may result in unacceptable human health risks associated with PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and inorganics (arsenic and chromium).

Subsurface Soil

The risk-based screening for subsurface soil at AOC 1 North is provided in **Appendix A**, **Attachment A.1**, **Tables 2.3** and **2.3a**.

- In Step 1, three constituents were detected in subsurface soil samples above background concentrations (for inorganics) and the human health screening levels, and were selected as COPCs: aluminum, arsenic, and cobalt.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-5} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ hazard indices (HIs) calculated for the COPCs ranged from 0.2 to 0.4; these HI values do not exceed the cumulative target organ HI risk-ratio screening benchmark of 0.5. No constituents were identified as COPCs.

Exposure to subsurface soil at AOC 1 North would not be expected to result in any unacceptable human health risks.

Groundwater

The risk-based screening for groundwater at AOC 1 North is provided in **Appendix A**, **Attachment A.1**, **Tables 2.5** and **2.5a**.

- In Step 1, thirteen constituents were detected in groundwater samples above background concentrations and the human health screening levels, and were selected as COPCs: aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, and vanadium. The maximum detected lead concentration is 130 micrograms per liter (µg/L), which is greater than the lead screening level (15 µg/L). The arithmetic mean concentration of lead in AOC 1 North groundwater is 48 µg/L, also above the lead

screening level. Therefore, lead is considered to be present at a concentration of potential concern, and lead was retained as a COPC.

- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 4×10^{-2} was calculated (associated with arsenic and chromium); this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.4 to 18; most of the HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or the cumulative HI were identified as COPCs and include aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, manganese, selenium, and vanadium.

Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at AOC 1 North may result in unacceptable human health risks associated with aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, selenium, and vanadium.

AOC 1 South

Surface Soil

The risk-based screening for surface soil at AOC 1 South is provided in **Appendix A**, **Attachment A.1**, **Tables 2.2** through **2.2b**.

- In Step 1, eleven constituents were detected in surface soil samples above background concentrations and the human health screening levels, and were selected as COPCs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, aluminum, arsenic, chromium, iron, lead, and manganese. The average lead concentration in the AOC 1 South surface soil is 162 mg/kg, which is less than the lead screening level (400 mg/kg). Therefore, lead is not considered to be present at a concentration of potential concern, and lead was eliminated as a COPC.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 3×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.2 to 0.6; one HI value (associated with iron) was greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or the cumulative HI were identified as COPCs and include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, chromium, and iron.
- In Step 3, based on the use of the 95 percent UCL for the EPC, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. A cumulative target HI of 0.4 was calculated for the COPC; this HI value is less than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk were identified as COPCs and include benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, and chromium.

Exposure to surface soil at AOC 1 South may result in unacceptable human health risks associated with PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and inorganics (arsenic and chromium).

Subsurface Soil

The risk-based screening for subsurface soil at AOC 1 South is provided in **Appendix A**, **Attachment A.1**, **Tables 2.4** through **2.4b**.

- In Step 1, ten constituents were detected in subsurface soil samples above background concentrations and the human health screening levels, and were selected as COPCs: benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, aluminum, antimony, arsenic, cobalt, iron, lead, and manganese. The average lead concentration in AOC 1 South subsurface soil is 478 mg/kg, which is greater than the lead screening level

(400 mg/kg). Therefore, lead is considered to be present at a concentration of potential concern, and lead was identified as a COPC.

- In Step 2, based on the maximum-detected concentration for each COPC, a cumulative cancer risk of 6×10^{-5} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.2 to 1; two HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or cumulative target organ HI above 0.5 were identified as COPCs and include benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene, antimony, arsenic, and iron.
- In Step 3, based on the use of the 95 percent UCL for the EPCs, a cumulative cancer risk of 5×10^{-5} was calculated; this value does not exceed the 5×10^{-5} risk-ratio screening benchmark. Cumulative target HIs of 0.5 and 1.0 were calculated for the COPCs; one HI value is greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. The constituent contributing to the cumulative HI greater than 0.5 was identified as a COPC and is antimony.

Exposure to subsurface soil at AOC 1 South may result in unacceptable human health risks associated with antimony and lead. The maximum detected concentration of antimony—one of the two COPCs identified in subsurface soil at the site—was used in the screening since the calculated 95 percent UCL was greater than the maximum detected concentration. The maximum detected concentrations of both antimony and lead were in sample SB15. This is the only sample in which the antimony and lead concentrations exceeded the screening levels.

Groundwater

The risk-based screening for groundwater at AOC 1 South is provided in **Appendix A**, **Attachment A.1**, **Tables 2.6** and **2.6a**.

- In Step 1, seven constituents were detected in groundwater samples above background concentrations and the human health screening levels, and were selected as COPCs: aluminum, arsenic, chromium, iron, lead, manganese, and vanadium. The maximum lead concentration in AOC 1 South groundwater is 94 µg/L, which is greater than the lead screening level. The average concentration of lead in AOC 1 South groundwater is 25 µg/L, which is also greater than the lead screening level. Therefore, lead is considered to be present at a concentration of potential concern and lead was retained as a COPC.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 4×10^{-3} was calculated; this value greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 1 to 4; all of the HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or the cumulative HI were identified as COPCs and include: aluminum, arsenic, chromium, iron, manganese, and vanadium.

Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at AOC 1 South may result in unacceptable human health risks associated with aluminum, arsenic, chromium, iron, lead, manganese, and vanadium. The risks and hazards associated with AOC 1 South groundwater were primarily associated with results from sample DW04. Concentrations in this sample were over an order of magnitude greater than the concentrations in the filtered sample from this location.

Ecological Risk Evaluation

The results of the risk evaluation for AOC 1 are presented in **Tables B-4** through **B-15** of **Appendix B**.

AOC 1 North

Surface Soil

Eight inorganics (aluminum, arsenic, cyanide, iron, lead, manganese, mercury, and zinc) and two organics (endrin and endrin aldehyde) exceeded screening values based upon maximum detected concentrations and, except for

iron, background concentrations, where available (**Appendix B, Tables B-4** and **B-5**). A screening value was not available for benzaldehyde. Therefore, aluminum, arsenic, cyanide, lead, manganese, mercury, zinc, endrin, endrin aldehyde, and benzaldehyde were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Benzaldehyde, which did not have a screening value, was detected at a maximum concentration of 260 µg/kg. This maximum concentration was compared with the range of soil screening values for all other SVOCs (not including atrazine, an herbicide) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 380 to 40,000 µg/kg. The maximum site concentration of benzaldehyde was less than the soil screening values for these other SVOCs. Thus, this constituent was not identified as a refined COPC.
- The mean hazard quotients (HQs) for aluminum, arsenic, cyanide, lead, manganese, and mercury were less than 1. Thus, these constituents were not identified as refined COPCs.
- The mean HQ exceeded 1.0 for endrin (1.16), endrin aldehyde (1.13), and zinc (1.10); these three constituents were identified as refined COPCs. However, ecological risks are likely to be low because of the very small size of the site (0.2 acre).
- Subsurface Soil

Aluminum exceeded screening values based on maximum detected concentrations and also exceeded the background concentrations (**Appendix B, Tables B-8** and **B-9**). Iron also exceeded screening values but did not exceed the background concentration. A screening value was not available for 2-butanone. Thus, aluminum and 2-butanone were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 2-Butanone, which did not have a screening value, was detected at a maximum concentration of 2.00 µg/kg. This maximum concentration was compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 173 to 64,000 µg/kg. The maximum site concentration of 2-butanone was less than the soil screening values for these other VOCs. Thus, this constituent was not identified as a refined COPC.
- Aluminum exceeded its pH-based soil screening value in 1 of 10 samples by a small margin (5.4 versus a screening value of < 5.5). However, the mean pH at the site was greater than 5.5 and the one sample whose pH was below the screening value had a soil concentration that was less than the background concentration. Thus, this constituent was not identified as a refined COPC.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with subsurface soil.

Groundwater

Sixteen inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered samples and also exceeded background concentrations, where available (**Appendix B, Tables B-12** and **B-13**). Aluminum, iron, and manganese exceeded screening values based on maximum detected concentrations in filtered sample and also exceeded background values, where available. Thus, aluminum, iron, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- While the mean HQs for aluminum, iron, and manganese exceeded 1.0 based on undiluted concentrations, none of the mean HQs exceeded 1.0 when a dilution factor of 10 was applied. Thus, none of these three constituents was identified as a refined COPC.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

AOC 1 South

Surface Soil

Six inorganics (arsenic, copper, lead, manganese, mercury, and zinc) exceeded screening values based on maximum detected concentrations and also exceeded background concentrations, where available (**Appendix B, Tables B-6** and **B-7**). Screening values were not available for 2-butanone, acetone, and carbazole. Thus, these nine constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Acetone and 2-butanone, which did not have screening values, were detected at maximum concentrations of 34.0 and 8.00 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 173 to 64,000 µg/kg. The maximum site concentrations of acetone and 2-butanone were less than the soil screening values for these other VOCs. Thus, these constituents were not identified as refined COPCs.
- Carbazole was detected in one surface soil sample at a maximum concentration of 610 µg/kg (0.61 mg/kg). While there is little information regarding the potential toxicity to soil invertebrates and terrestrial plants following direct exposure to this chemical, available data suggest that the maximum observed concentrations of this chemical are too low to elicit adverse effects. In 21-day studies with oligochaete worms exposed to carbazole-spiked soils, the resulting lethal concentration (survival) to 50 percent of the population (LC_{50}) and effect concentration (reproduction) to 50 percent of the population (EC_{50}) values were greater than 2,100 and 52 mg/kg, respectively (Sverdrup et al., 2002). In a similar 21-day study exposing collembolans or springtails to spiked soils, the LC_{50} and EC_{50} values were 2,500 and 35 mg/kg, respectively, for carbazole (Sverdrup et al., 2001). Applying an uncertainty factor of 5 (**Appendix B, Table B-3a**) to the lower of the two EC_{50} (chronic lowest observed effect concentration [LOEC]) values (to approximate a chronic no observed effect concentration [NOEC]) yields an effects concentration of 7.00 mg/kg. The maximum concentration of carbazole is below this effect concentration. Thus, carbazole was not identified as a refined COPC.
- The mean HQs for arsenic, copper, and mercury were less than 1. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded 1.0 for lead (1.35), manganese (1.16), and zinc (1.11); these three constituents were identified as refined COPCs.

Subsurface Soil

Five inorganics (copper, iron, lead, manganese, and zinc) exceeded screening values based on maximum detected concentrations and also exceeded background values, where available (**Appendix B, Tables B-10** and **B-11**). Screening values were not available for 2-butanone, acetone, and carbon disulfide. Thus, these eight constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Acetone, 2-butanone, and carbon disulfide, which did not have screening values, were detected at maximum concentrations of 48.0, 9.00, and 2.00 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 173 to 64,000 µg/kg. The maximum site concentrations of acetone, 2-butanone, and carbon disulfide were less than the soil screening values for these other VOCs. Thus, these constituents were not identified as refined COPCs.
- The mean HQs for copper, iron, and manganese were less than 1. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded 1.0 for lead (3.99) and zinc (1.85); these two constituents were identified as refined COPCs.

While three constituents in surface soil (lead, manganese, and zinc) and two constituents in subsurface soil (lead and zinc) were identified as refined COPCs, ecological risks are likely to be low because of the small size of the site (0.4 acre).

Groundwater

Twelve inorganics (aluminum, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, vanadium, and zinc) exceeded screening values based on maximum detected concentrations in unfiltered samples and also exceeded background values, where available (**Appendix B, Tables B-14** and **B-15**). Aluminum, barium, iron, lead, and manganese exceeded screening values based on maximum detected concentrations in filtered samples and also exceeded background concentrations, where available. Thus, aluminum, barium, iron, lead, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for lead did not exceed 1.0. Thus, lead was not identified as a refined COPC.
- While the mean HQs for aluminum, barium, and manganese exceeded one based upon undiluted concentrations, none of the mean HQs exceeded one when a dilution factor of 10 was applied. Thus, none of these three constituents was identified as a refined COPC.
- The mean HQ for iron exceeded 1.0 with a dilution factor of 10 applied. Thus, iron was identified as a refined COPC.

There was one refined COPC (iron) identified for the AOC 1 South groundwater.

3.3 AOC 1 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Analysis and is summarized in **Table 3-7**.

3.3.1 Step 1 – Determination of Potential CERCLA Eligibility and, if CERCLA eligible, has a CERCLA-Related Release Occurred at the Site?

Historical information indicates the site is an unlined, non-permitted disposal area whose date(s) of debris disposal are unknown. Debris identified at AOC 1, some possibly dating back to the WWI era, includes wood and metal debris, and corroded cylinders. AOC 1 was listed as a “Site Screening Area (SSA) Under Site Screening Process” within the FFA (Navy, 2005). Since SVOCs, pesticides, and inorganic constituents were observed above background levels during the SI, it is considered to be CERCLA-eligible. AOC 1 is further evaluated in the decision analysis process in Step 2a.

3.3.2 Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a—Comparison of Data Against Conservative Risk-Based Screening Values

Specifically, the data for the CERCLA-related constituents detected at AOC 1 were compared to the screening criteria described in Section 1 and exceedances of the screening criteria are identified on **Tables 3-1 through 3-6**. Those constituents that exceed one or more criteria (and background, if available, for inorganics) are shown in **Figures 3-5 through 3-7 and Figures 3-9 through 3-11**.

AOC 1 North

In summary, five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and ideno(1,2,3-cd)pyrene), two pesticides (endrin and endrin aldehyde), and nine inorganics (aluminum, arsenic, chromium, cyanide, lead, manganese, mercury, vanadium, and zinc) exceeded one or more screening criterion in surface soil. Three inorganics (aluminum, arsenic, and cobalt) exceeded at least one screening criterion in subsurface soil.

In groundwater, 16 total inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc) and five dissolved inorganics (aluminum, arsenic, cobalt, iron, and manganese) exceeded at least one screening criterion.

AOC 1 South

In summary, five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and ideno(1,2,3-cd)pyrene) and nine inorganics (aluminum, arsenic, chromium, copper, iron, lead, manganese, mercury and zinc) exceeded screening criteria in surface soil. Three SVOCs (benzo(a) pyrene, benzo(b)fluoranthene, and ideno(1,2,3-cd)pyrene) and nine inorganics (aluminum, antimony, arsenic, cobalt, copper, iron, lead, manganese, and zinc) exceeded at least one screening criterion in subsurface soil.

In groundwater, 13 total inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, vanadium, and zinc) and six dissolved inorganics (aluminum, arsenic, barium, iron, lead, and manganese) exceeded at least one screening criterion.

Step 2b – Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

Human Health Risk Evaluation

AOC 1 North

Exposure to surface soil may result in unacceptable human health risks associated with PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and inorganics (arsenic and chromium). Exposure to subsurface soil would not be expected to result in any unacceptable human health risks. Exposure to groundwater may result in unacceptable human health risks associated with aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, selenium, and vanadium.

AOC 1 South

Exposure to surface soil may result in unacceptable human health risks associated with PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) and inorganics (arsenic and chromium). Exposure to subsurface soil may result in unacceptable human health risks associated with antimony and lead. Exposure to groundwater may result in unacceptable human health risks associated with aluminum, arsenic, chromium, iron, lead, manganese, and vanadium.

Ecological Risk Evaluation

AOC 1 North

Potential unacceptable risks were identified for exposure to surface soil attributable to endrin, endrin aldehyde, and zinc. However, endrin and endrin aldehyde (with detections less than 50 µg/kg) are likely attributable to normal pesticide application. Also, ecological risks are likely to be low because of the very small size of the site (0.2 acre).

AOC 1 South

Potential unacceptable ecological risks were identified for exposure to surface soil attributable to lead, manganese, and zinc and to subsurface soil attributable to lead and zinc. However, potential ecological risks are likely to be low because of the small size of the site (0.4 acre). Potential unacceptable ecological risks were also identified with groundwater attributable to iron.

3.3.3 Step 3 – Is Further Investigation or Action Required?

AOC 1 North

Additional delineation of the surface debris material is not required, as the 1999 geophysical survey sufficiently delineated the extent. Results from the soil sampling indicate potential risks to human health and/or the environment associated with exposure to PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene), and inorganics (arsenic, chromium, and zinc) in surface soil.

Results from the groundwater sampling indicate potential human health risks associated with aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, selenium, and vanadium. An Expanded Site Inspection (ESI) is recommended to further verify and characterize the extent of SVOC (PAHs) and inorganic contamination in the localized surface soil "hot spot" areas. Permanent monitoring wells are recommended to confirm the results of elevated inorganic (total and dissolved) constituent concentrations (in particular upgradient of the site) and verify the groundwater flow directions. Also, the human health screening assumed that all of the chromium detected in soil was in the hexavalent, not the trivalent, form, which is highly unlikely. Therefore, it is recommended the ESI include chromium speciation analysis for the soil samples.

AOC 1 South

Additional delineation of the surface debris material is not required, as the 1999 geophysical survey sufficiently delineated the extent. Results from the soil sampling indicate potential risks to human health and/or the environment associated with exposure to PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene) and inorganics (arsenic, chromium, lead, manganese, and zinc) in surface soil and inorganics (antimony, lead, and zinc) in subsurface soil. Results from the groundwater sampling indicate potential human health risks associated with aluminum, arsenic, chromium, iron, lead, manganese, and vanadium. An ESI is recommended to further verify and characterize the extent of SVOC (PAHs) and inorganic contamination in the localized surface and subsurface soil "hot spot" areas. Permanent monitoring wells are recommended to confirm the results of elevated inorganic (total and dissolved) constituent concentrations (in particular upgradient of the site) and verify the groundwater flow directions. Also, the collection of surface water and sediment samples is recommended to evaluate the potential transport of SVOC (PAHs) and inorganics from the site to these media. Although the human health screening assumed that all of the chromium detected in soil was in the hexavalent, not the trivalent, form, which is highly unlikely, no chromium speciation analysis for soil is necessary because the SI concentrations are within background.

Following the ESI, an interim removal action may be recommended to address the localized SVOC and inorganic constituent exceedances in soil. **Table 3-7** summarizes the results of the decision analysis for AOC 1.

TABLE 3-1
AOC 1 North Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06	
Sample ID					CAA01-SS01-1108	CAA01-SS02-1108	CAA01-SS02P-1108	CAA01-SS03-1108	CAA01-SS03-1208	CAA01-SS04-1108	CAA01-SS05-1108	CAA01-SS06-1108	CAA01-SS06P-1108
Sample Date					11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name													
Volatile Organic Compounds (UG/KG)													
Styrene	--	64,000	870,000	630,000	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U
Semivolatile Organic Compounds (UG/KG)													
Benzaldehyde	--	--	1,200,000	780,000	490 U	420 U	380 U	400 U	NA	**260 J**	**230 J**	400 U	400 U
Benzo(a)anthracene	--	HMW PAH	2,100	150	490 U	420 U	380 U	400 U	NA	450 U	**330 J**	400 U	400 U
Benzo(a)pyrene	--	HMW PAH	210	15	490 U	420 U	380 U	400 U	NA	450 U	**300 J**	400 U	400 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	490 U	420 U	380 U	400 U	NA	**240 J**	**740**	400 U	400 U
Benzo(g,h,i)perylene	--	HMW PAH	1,700,000	170,000	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	490 U	420 U	380 U	400 U	NA	450 U	**540**	400 U	400 U
Chrysene	--	HMW PAH	210,000	15,000	490 U	420 U	380 U	400 U	NA	450 U	**440**	400 U	400 U
Dibenz(a,h)anthracene	--	HMW PAH	210	15	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	490 U	420 U	380 U	400 U	NA	450 U	**440**	400 U	400 U
Indeno(1,2,3-cd)pyrene	--	HMW PAH	2,100	150	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U
PAH (HMW)	--	18,000	--	--	2,205 U	1,890 U	1,710 U	1,800 U	NA	**2,040**	**3,805**	1,800 U	1,800 U
PAH (LMW)	--	29,000	--	--	2,205 U	1,890 U	1,710 U	1,800 U	NA	2,025 U	**2,080**	1,800 U	1,800 U
Pyrene	--	HMW PAH	1,700,000	170,000	490 U	420 U	380 U	400 U	NA	450 U	**840**	400 U	400 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	--	583	7,200	2,000	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 U	4.2 U	4.1 U
4,4'-DDE	--	114	5,100	1,400	4.7 U	**0.23 J**	3.8 U	NA	**0.72 J**	**0.45 J**	**1.1 K**	4.2 U	4.1 U
4,4'-DDT	--	100	7,000	1,700	4.7 U	3.8 U	3.8 U	NA	**3.5 J**	**1.8 J**	**2.6 J**	4.2 U	4.1 U
Endosulfan I	--	6.32	370,000	37,000	2.4 U	1.9 U	1.9 U	NA	2.2 U	**0.29 J**	2 U	2.1 U	2 U
Endrin	--	1.95	18,000	1,800	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	**2.7 K**	4.2 U	4.1 U
Endrin aldehyde	--	1.95	18,000	1,800	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	**2.1 J**	4.2 U	4.1 U
gamma-Chlordane	--	11.0	6,500	1,600	2.4 U	1.9 U	1.9 U	NA	**2 J**	2.3 U	2 U	2.1 U	2 U
Explosives (UG/KG)													
					ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Metals (MG/KG)													
Aluminum	12,200	pH < 5.5	99,000	7,700	**8,670**	**6,780**	**5,490**	**8,280**	NA	**8,400**	**5,880**	**18,200**	**12,200**
Antimony	11	78.0	41	3.1	**0.08 L**	7.3 UL	5.2 UL	6.4 UL	NA	**1.2 L**	5.4 UL	**0.24 L**	**0.11 L**
Arsenic	6.36	18.0	1.6	0.39	**3.3 L**	**4.4 L**	**3.9 L**	**4 L**	NA	**47.5 L**	**2.4 L**	**2.5 L**	**1.6 L**
Barium	52.9	330	19,000	1,500	**41.2**	**46.9**	**41**	**42.9 K**	NA	**82**	**49.6**	**30.3**	**25.2**
Beryllium	0.587	40.0	200	16	**0.56**	**0.65**	**0.58**	**0.5 J**	NA	**0.54**	**0.39 J**	**0.23 J**	**0.17 J**
Cadmium	1.5	32.0	80	7	**0.11 J**	**0.12 J**	**0.06 J**	0.01 B	NA	**0.56**	**0.12 J**	0.35 U	0.32 U
Calcium	2,290	--	--	--	**19,200**	**1,380**	**1,350**	**2,320**	NA	**11,600**	**2,150**	**1,720**	**1,900**
Chromium	18.2	64.0	5.6	0.29	**11.2**	**8.1**	**6.7**	**11.6**	NA	**20.8**	**7.7**	**18.9**	**13**
Cobalt	9.93	13.0	30	2.3	**3.5 J**	**9 J**	**7.9 J**	**3.3 J**	NA	**3.8 J**	**3.2 J**	**1.1 J**	**0.86 J**
Copper	4.25	70.0	4,100	310	**4.7**	**3.9**	**3**	**8.9**	NA	**33**	**4**	**2.2**	**1.7**
Cyanide	--	15.8	2,000	160	0.65 U	0.6 U	0.55 U	0.6 U	NA	**29**	0.6 U	0.55 U	0.6 U
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**6,840**	**8,000**	**7,240**	**11,000**	NA	**14,200**	**5,950**	**12,500**	**7,460**
Lead	17.4	120	800	400	**13.1**	**16.6**	**14.4**	**30**	NA	**83.7**	**26.6**	**7.4**	**8**
Magnesium	1,070	--	--	--	**1,280 J**	**426 J**	**371 J**	**991**	NA	**1,060 J**	**421 J**	**514 J**	**374 J**
Manganese	324	220	2,300	180	**57.8 L**	**153 L**	**138 L**	**120 L**	NA	**387 L**	**145 L**	**31.8 L**	**30.3 L**
Mercury	0.111	0.10	31	2.3	0.13 U	0.13 U	0.12 U	0.12 UL	NA	**0.09 J**	0.12 U	0.12 U	**0.07 J**
Nickel	9.52	38.0	2,000	150	**5.4 J**	**5.6 J**	**4.8 J**	**5.9**	NA	**6.6 J**	**3.8 J**	**3 J**	**2.4 J**
Potassium	708	--	--	--	**417 J**	**436 J**	**338 J**	**606 J**	NA	**707 J**	**394 J**	**569 J**	**391 J**
Selenium	0.51	0.52	510	39	3.3 UL	4.3 UL	3 UL	3.8 U	NA	3.4 UL	3.2 UL	**0.31 L**	2.2 UL
Silver	2.1	560	510	39	0.95 U	1.2 U	0.87 U	1.1 U	NA	**0.24 J**	0.9 U	**0.08 J**	**0.07 J**
Sodium	521	--	--	--	**42.7 J**	**27.3 J**	**17.8 J**	31.4 B	NA	**48.1 J**	**18.5 J**	**27.8 J**	21 B
Vanadium	27.9	130	520	39	**13.3**	**13.2**	**11.2**	**19.2**	NA	**17.6**	**12**	**40.8**	**23.1**
Zinc	26.5	120	31,000	2,300	**34.5 L**	**30.2 L**	**24.8 L**	**35.8 K**	NA	**316 L**	**51.4 L**	**14.8 L**	**16.7 L**

TABLE 3-1
AOC 1 North Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06	
Sample ID					CAA01-SS01-1108	CAA01-SS02-1108	CAA01-SS02P-1108	CAA01-SS03-1108	CAA01-SS03-1208	CAA01-SS04-1108	CAA01-SS05-1108	CAA01-SS06-1108	CAA01-SS06P-1108
Sample Date					11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name													
Wet Chemistry													
% Solids (pct)	--	--	--	--	**68**	**79**	**86**	**82**	**77**	**73**	**81**	**82**	**82**
pH (ph)	--	--	--	--	**8.2**	**6.3**	NA	**6.4**	NA	**7.9**	**7.1**	**6.4**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**39,000**	**44,000**	NA	**54,000**	NA	**110,000**	**38,000**	**30,000**	NA

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
NA - Not analyzed
ND - No detections
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
LMW PAH - Low molecular weight Polycyclic Aromatic Hydrocarbons
HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 3-1
AOC 1 North Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO07		CAA01-SO08	CAA01-SO09	CAA01-SO11	CAA01-SO16
Sample ID					CAA01-SS07-1108	CAA01-SS07-1208	CAA01-SS08-1108	CAA01-SS09-1108	CAA01-SS11-1108	CAA01-SS16-1108
Sample Date					11/05/08	12/18/08	11/07/08	11/07/08	11/07/08	11/07/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name										
Volatile Organic Compounds (UG/KG)										
Styrene	--	64,000	870,000	630,000	12 U	NA	12 U	**3 J**	17 U	**3 J**
Semivolatile Organic Compounds (UG/KG)										
Benzaldehyde	--	--	1,200,000	780,000	400 U	NA	380 U	400 U	560 UL	400 U
Benzo(a)anthracene	--	HMW PAH	2,100	150	400 U	NA	380 U	400 U	**370 L**	400 U
Benzo(a)pyrene	--	HMW PAH	210	15	400 U	NA	380 U	400 U	**750 L**	400 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	400 U	NA	380 U	400 U	**2,400 L**	400 U
Benzo(g,h,i)perylene	--	HMW PAH	1,700,000	170,000	400 U	NA	380 U	400 U	**1,000 L**	400 U
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	400 U	NA	380 U	400 U	**820 L**	400 U
Chrysene	--	HMW PAH	210,000	15,000	400 U	NA	380 U	400 U	**1,400 L**	400 U
Dibenz(a,h)anthracene	--	HMW PAH	210	15	400 U	NA	380 U	400 U	**330 L**	400 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	400 U	NA	380 U	400 U	560 UL	400 U
Indeno(1,2,3-cd)pyrene	--	HMW PAH	2,100	150	400 U	NA	380 U	400 U	**750 L**	400 U
PAH (HMW)	--	18,000	--	--	1,800 U	NA	1,710 U	1,800 U	**8,110 L**	1,800 U
PAH (LMW)	--	29,000	--	--	1,800 U	NA	1,710 U	1,800 U	2,520 U	1,800 U
Pyrene	--	HMW PAH	1,700,000	170,000	400 U	NA	380 U	400 U	**290 L**	400 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	--	583	7,200	2,000	NA	3.9 U	**1.7 J**	4.5 U	5.1 U	4.1 U
4,4'-DDE	--	114	5,100	1,400	NA	3.9 U	**2.8 J**	4.5 U	**1.8 J**	4.1 U
4,4'-DDT	--	100	7,000	1,700	NA	3.9 U	**3.8 J**	4.5 U	**4.7 J**	4.1 U
Endosulfan I	--	6.32	370,000	37,000	NA	2 U	1.9 U	2.2 U	2.6 U	2 U
Endrin	--	1.95	18,000	1,800	NA	3.9 U	3.9 U	4.5 U	**3.3 J**	4.1 U
Endrin aldehyde	--	1.95	18,000	1,800	NA	3.9 U	3.9 U	4.5 U	**3.1 J**	4.1 U
gamma-Chlordane	--	11.0	6,500	1,600	NA	2 U	1.9 U	2.2 U	2.6 U	**1.9 J**
Explosives (UG/KG)										
					ND	NA	ND	NA	NA	NA
Total Metals (MG/KG)										
Aluminum	12,200	pH < 5.5	99,000	7,700	**8,510**	NA	**8,940**	**6,140**	**11,400**	**7,310**
Antimony	11	78.0	41	3.1	5.6 UL	NA	5.4 UL	5.9 UL	**1 L**	6.6 UL
Arsenic	6.36	18.0	1.6	0.39	**2.1 L**	NA	**2.7**	**1.5**	**16.8**	**4.5**
Barium	52.9	330	19,000	1,500	**30.3 K**	NA	**39.9**	**19.3 J**	**124**	**22.5**
Beryllium	0.587	40.0	200	16	**0.48**	NA	**0.44 J**	**0.33 J**	**0.78**	**0.4 J**
Cadmium	1.5	32.0	80	7	0.03 B	NA	0.04 B	0.49 U	**1.3**	**0.08 J**
Calcium	2,290	--	--	--	**4,610**	NA	**2,470**	**317 J**	**24,300**	**1,200**
Chromium	18.2	64.0	5.6	0.29	**7.1**	NA	**11.9**	**5.3**	**48.7**	**13.6**
Cobalt	9.93	13.0	30	2.3	**3.8 J**	NA	**2.2 J**	**1.8 J**	**3.9 J**	**2.7 J**
Copper	4.25	70.0	4,100	310	**3**	NA	**6.7**	**2.3 J**	**17.5**	**3.2**
Cyanide	--	15.8	2,000	160	0.55 U	NA	0.55 U	0.6 U	0.85 U	0.55 U
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**4,160**	NA	**8,440**	**3,320**	**17,000**	**17,100**
Lead	17.4	120	800	400	**10.9**	NA	**35.2**	**14**	**121**	**12.4**
Magnesium	1,070	--	--	--	**521**	NA	**1,270**	**299 J**	**1,890**	**550**
Manganese	324	220	2,300	180	**92.7 L**	NA	**119**	**29.7**	**426**	**51.7**
Mercury	0.111	0.10	31	2.3	0.12 UL	NA	0.04 B	0.05 B	**0.15**	0.05 B
Nickel	9.52	38.0	2,000	150	**3.8**	NA	**3.9**	**2.8 J**	**8.9**	**4.6**
Potassium	708	--	--	--	**331 J**	NA	**487**	**236 J**	**893**	**750**
Selenium	0.51	0.52	510	39	3.3 U	NA	3.2 U	3.4 U	4.9 U	3.8 U
Silver	2.1	560	510	39	0.94 U	NA	**0.18 J**	**0.07 J**	**0.55 J**	1.1 U
Sodium	521	--	--	--	25.8 B	NA	29.6 B	17.7 B	64.1 B	23.3 B
Vanadium	27.9	130	520	39	**11.1**	NA	**16.4**	**10.7**	**22.8**	**23**
Zinc	26.5	120	31,000	2,300	**19.6 K**	NA	**36.3**	**11.3**	**872**	**26.6**

TABLE 3-1
AOC 1 North Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO07		CAA01-SO08	CAA01-SO09	CAA01-SO11	CAA01-SO16
Sample ID					CAA01-SS07-1108	CAA01-SS07-1208	CAA01-SS08-1108	CAA01-SS09-1108	CAA01-SS11-1108	CAA01-SS16-1108
Sample Date					11/05/08	12/18/08	11/07/08	11/07/08	11/07/08	11/07/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name										
Wet Chemistry										
% Solids (pct)	--	--	--	--	**82**	**85**	**86**	**83**	**59**	**82**
pH (ph)	--	--	--	--	**8.4**	NA	**7.3**	**5.3**	**7.5**	**7.3**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**9,200**	NA	**18,000**	**28,000**	**140,000**	**27,000**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
NA - Not analyzed
ND - No detections
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
LMW PAH - Low molecular weight Polycyclic Aromatic Hydrocarbons
HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 3-2
AOC 1 North Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07	
Sample ID					CAA01-SB01-1108	CAA01-SB02-1108	CAA01-SB02P-1108	CAA01-SB03-1108	CAA01-SB03-1208	CAA01-SB04-1108	CAA01-SB05-1108	CAA01-SB06-1108	CAA01-SB06P-1108	CAA01-SB07-1108	CAA01-SB07-1208
Sample Date					11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08
Sample Depth					6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"
Chemical Name															
Volatile Organic Compounds (UG/KG)															
2-Butanone	--	--	20,000,000	2,800,000	**2 J**	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA
Styrene	--	64,000	870,000	630,000	14 U	**2 J**	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA
Toluene	--	40,000	820,000	500,000	14 U	**2 J**	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA
Semivolatile Organic Compounds (UG/KG)															
PAH (HMW)	--	18,000	--	--	2,025 U	1,665 U	1,665 U	1,620 U	NA	1,620 U	**1,680 J**	1,755 U	1,755 U	1,935 U	NA
Pyrene	--	HMW PAH	1,700,000	170,000	450 U	370 U	370 U	360 U	NA	360 U	**120 J**	390 U	390 U	430 U	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)															
4,4'-DDD	--	583	7,200	2,000	4.2 U	3.7 U	3.7 U	NA	**0.87 J**	3.6 U	3.6 U	3.9 U	4 U	NA	4 U
4,4'-DDE	--	114	5,100	1,400	**0.23 J**	3.7 U	3.7 U	NA	**1.6 J**	**0.27 J**	3.6 U	3.9 U	4 U	NA	4 U
4,4'-DDT	--	100	7,000	1,700	4.2 U	3.7 U	3.7 U	NA	**3.4 J**	3.6 U	3.6 U	3.9 U	4 U	NA	4 U
Explosives (UG/KG)															
					ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	NA
Total Metals (MG/KG)															
Aluminum	13,000	pH < 5.5	99,000	7,700	**7,560**	**8,540**	**7,980**	**10,400**	NA	**5,680**	**6,130**	**19,200**	**18,600**	**7,680**	NA
Antimony	--	78.0	41	3.1	**0.09 L**	5.1 UL	4.9 UL	5.5 UL	NA	4 UL	6.1 UL	3.8 UL	5.5 UL	3.9 UL	NA
Arsenic	5.54	18.0	1.6	0.39	**1.6 L**	**6 L**	**6.8 L**	**5.3 L**	NA	**2 L**	**2 L**	**1.7 L**	**2.2 L**	**2.1 L**	NA
Barium	84.5	330	19,000	1,500	**27**	**28.1**	**28.8**	**42.2 K**	NA	**25.3**	**26**	**15.3**	**20.2**	**26.2 K**	NA
Beryllium	0.52	40.0	200	16	**0.33 J**	**0.89**	**0.98**	**0.5**	NA	**0.35**	**0.37 J**	**0.13 J**	**0.17 J**	**0.58**	NA
Cadmium	--	32.0	80	7	**0.04 J**	0.43 U	0.41 U	0.46 U	NA	**0.03 J**	0.02 B	0.32 U	0.46 U	0.02 B	NA
Calcium	2,380	--	--	--	**16,400**	**572**	**566**	**2,740**	NA	**1,150**	**790**	**1,460**	**1,420**	**754**	NA
Chromium	33.7	64.0	5.6	0.29	**8.5**	**13.2**	**12.5**	**15.5**	NA	**6.9**	**7.4**	**18**	**18.6**	**6.2**	NA
Cobalt	5.18	13.0	30	2.3	**2.1 J**	**8.4 J**	**8.1 J**	**3 J**	NA	**2.8 J**	**3.4 J**	**0.52 J**	**0.76 J**	**6.7**	NA
Copper	3.17	70.0	4,100	310	**3.6**	**3.1**	**2.9**	**11**	NA	**2.2**	**2.6 J**	**1.5 J**	1.8 B	**2**	NA
Cyanide	2.7	15.8	2,000	160	0.55 U	0.5 U	0.5 U	0.5 U	NA	0.55 U	**10**	0.6 U	0.6 U	0.6 U	NA
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**4,740**	**16,200**	**17,600**	**16,900**	NA	**6,800**	**5,770**	**10,500**	**11,500**	**3,980**	NA
Lead	8.79	120	800	400	**7.5**	**9.7**	**10.4**	**41.2**	NA	**14.2**	**9.6**	**5.3**	**6.1**	**8**	NA
Magnesium	1,120	--	--	--	**922 J**	**532 J**	**464 J**	**1,060**	NA	**310 J**	**276 J**	**407 J**	**468 J**	**313 J**	NA
Manganese	176	220	2,300	180	**36.1 L**	**82.6 L**	**88.9 L**	**98.4 L**	NA	**42.9 L**	**49.8 L**	**10.3 L**	**14.2 L**	**57.9 L**	NA
Nickel	17.6	38.0	2,000	150	**3.6 J**	**9.7 J**	**8.6 J**	**6.6**	NA	**3.1 J**	**3.1 J**	**2.6 J**	**2.6 J**	**4.7**	NA
Potassium	901	--	--	--	**318 J**	**604 J**	**516 J**	**732 J**	NA	**306 J**	**318 J**	**469 J**	**512 J**	**246 J**	NA
Selenium	0.64	0.52	510	39	2.5 UL	3 UL	2.8 UL	**0.44 J**	NA	2.3 UL	3.6 UL	2.2 UL	3.2 UL	2.3 U	NA
Silver	1.1	560	510	39	0.73 U	0.86 U	**0.09 J**	**0.11 J**	NA	0.66 U	1 U	**0.07 J**	**0.11 J**	0.66 U	NA
Sodium	811	--	--	--	**28.3 J**	**23.4 J**	**21.4 J**	28.5 B	NA	**16.2 J**	**19.1 J**	**24.3 J**	26.2 B	20.7 B	NA
Vanadium	48.3	130	520	39	**10.8**	**19.4**	**23.3**	**22.1**	NA	**11.1**	**11.4**	**27.8**	**36.1**	**9**	NA
Zinc	28	120	31,000	2,300	**17.5 L**	**26.9 L**	**27 L**	**35 K**	NA	**20.3 L**	**12.1 L**	**5.2 L**	**8.5 L**	**10.8 K**	NA
Wet Chemistry															
% Solids (pct)	--	--	--	--	**73**	**89**	**90**	**92**	**87**	**92**	**85**	**85**	**84**	**77**	**83**
pH (ph)	--	--	--	--	**9.9**	**5.4**	NA	**7.1**	NA	**6.3**	**6.6**	**6.2**	NA	**6.8**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**18,000**	**14,000**	NA	**58,000**	NA	**4,700**	**10,000**	**3,200**	NA	**7,200**	NA

Notes:

Exceeds Background

Exceeds BKG & Res RSL

Exceeds BKG, Res & Ind RSLs

Bold indicates detection

NA - Not analyzed

ND - No detections

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 3-2
AOC 1 North Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO08	CAA01-SO09	CAA01-SO16
Sample ID					CAA01-SB08-1108	CAA01-SB09-1108	CAA01-SB16-1108
Sample Date					11/07/08	11/07/08	11/07/08
Sample Depth					6-24"	6-24"	6-24"
Chemical Name							
Volatile Organic Compounds (UG/KG)							
2-Butanone	--	--	20,000,000	2,800,000	11 U	10 U	12 U
Styrene	--	64,000	870,000	630,000	11 U	**1 J**	12 U
Toluene	--	40,000	820,000	500,000	11 U	10 U	12 U
Semivolatile Organic Compounds (UG/KG)							
PAH (HMW)	--	18,000	--	--	1,665 U	1,575 U	1,710 U
Pyrene	--	HMW PAH	1,700,000	170,000	370 U	350 U	380 U
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDD	--	583	7,200	2,000	**5.2**	3.5 U	3.9 U
4,4'-DDE	--	114	5,100	1,400	**26**	3.5 U	3.9 U
4,4'-DDT	--	100	7,000	1,700	**15**	3.5 U	3.9 U
Explosives (UG/KG)							
					ND	ND	ND
Total Metals (MG/KG)							
Aluminum	13,000	pH < 5.5	99,000	7,700	**10,500**	**5,370**	**11,600**
Antimony	--	78.0	41	3.1	3.7 UL	3.9 UL	**0.14 L**
Arsenic	5.54	18.0	1.6	0.39	**4.9**	**1.1**	**6.6**
Barium	84.5	330	19,000	1,500	**26.3**	**15.8**	**15.4**
Beryllium	0.52	40.0	200	16	**0.51**	**0.24 J**	**0.53**
Cadmium	--	32.0	80	7	0.31 U	0.32 U	0.69 U
Calcium	2,380	--	--	--	**2,470**	**93.4 J**	**246 J**
Chromium	33.7	64.0	5.6	0.29	**14.2**	**4.8**	**21.8**
Cobalt	5.18	13.0	30	2.3	**6.4**	**1.7 J**	**4.3 J**
Copper	3.17	70.0	4,100	310	**4.7**	**1.3 J**	**3.6**
Cyanide	2.7	15.8	2,000	160	0.55 U	0.5 U	0.55 U
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**13,600**	**2,470**	**28,900**
Lead	8.79	120	800	400	**22.2**	**6.9**	**10.2**
Magnesium	1,120	--	--	--	**1,200**	**246 J**	**691**
Manganese	176	220	2,300	180	**106**	**21**	**56.6**
Nickel	17.6	38.0	2,000	150	**5.6**	**2.3 J**	**6.7**
Potassium	901	--	--	--	**681**	**176 J**	**918**
Selenium	0.64	0.52	510	39	2.2 U	2.3 U	4.8 U
Silver	1.1	560	510	39	**0.25 J**	0.65 U	1.4 U
Sodium	811	--	--	--	27.8 B	12.4 B	19.1 B
Vanadium	48.3	130	520	39	**22**	**7.8**	**34.3**
Zinc	28	120	31,000	2,300	**33.2**	**6.5**	**21.8**
Wet Chemistry							
% Solids (pct)	--	--	--	--	**89**	**94**	**86**
pH (ph)	--	--	--	--	**7.6**	**6**	**5.5**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**12,000**	**8,700**	**8,000**

Notes:

Exceeds Background

Exceeds BKG & Res RSL

Exceeds BKG, Res & Ind RSLs

Bold indicates detection

NA - Not analyzed

ND - No detections

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 3-3
AOC 1 North Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW CC AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater (Dec. 2010)	CLEAN RSLs Tapwater Adjusted (Dec. 2010)	CAA01-DW01	CAA01-DW02	CAA01-DW03
Sample ID					CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108
Sample Date					11/03/08	11/03/08	11/04/08
Chemical Name							
Volatile Organic Compounds (UG/L)							
Acetone	--	1,500	--	2,200	10 U	3 B	**3 J**
Semivolatile Organic Compounds (UG/L)							
No Detections							
Pesticide/Polychlorinated Biphenyls (UG/L)							
No Detections							
Explosives (UG/L)							
No Detections							
Total Metals (UG/L)							
Aluminum	2,230	87.0	--	3,700	**11,200**	**3,420**	**142,000**
Arsenic	2.28	150	10	0.045	61.7 B	**18.4**	**731**
Barium	118	4.00	2,000	730	**91.4 J**	**73.1 J**	**931**
Beryllium	2.45	0.66	4	7.3	**0.8 J**	**0.23 J**	**11.7**
Cadmium	0.605	0.27	5	1.8	0.38 B	0.21 B	**1.7 J**
Calcium	158,000	--	--	--	**193,000**	**195,000**	**1,650,000**
Chromium	15.1	11.4	100	0.043	**61.5**	21.8 B	**1,050**
Cobalt	20.6	23.0	--	1.1	**7.3 J**	**2.8 J**	**90.5 J**
Copper	12.2	9.33	1,300	150	**14.8 J**	11.1 B	**170**
Iron	3,590	1,000	--	2,600	**29,200**	**8,440**	**449,000**
Lead	21.3	3.18	15	--	**11.2**	3.7 B	**130**
Magnesium	3,600	--	--	--	**4,900 J**	**7,380**	**50,500**
Manganese	57.9	120	--	88	**162**	**143**	**2,600**
Nickel	11.4	52.2	--	73	20.2 B	14 B	**323**
Potassium	3,490	--	--	--	**3,870 J**	**5,430**	**39,200**
Selenium	--	5.00	50	18	6.9 B	35 U	**64.4 J**
Silver	--	0.36	--	18	**0.44 J**	10 U	20 U
Sodium	9,920	--	--	--	**6,890**	**8,000**	**23,000**
Vanadium	26.2	20.0	--	18	**60.3**	**18.2 J**	**821**
Zinc	4.52	120	--	1,100	**62.6**	22.7 B	**758**
Dissolved Metals (UG/L)							
Aluminum, Dissolved	100	87.0	--	3,700	**723**	**187 J**	**384**
Antimony, Dissolved	9.7	30.0	6	1.5	**1.1 J**	**1.1 J**	60 U
Arsenic, Dissolved	1.37	150	10	0.045	6.5 B	3.3 B	**4.3 J**
Barium, Dissolved	127	4.00	2,000	730	**43.4 J**	**61.9 J**	**54.4 J**
Calcium, Dissolved	148,000	--	--	--	**144,000**	**183,000**	**167,000**
Chromium, Dissolved	6.04	11.0	100	0.043	**3.7 J**	**0.82 J**	**2.4 J**

TABLE 3-3

AOC 1 North Groundwater Detection and Exceedance Results

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW CC AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Dec. 2010)**	**CLEAN RSLs Tapwater Adjusted (Dec. 2010)**	CAA01-DW01	CAA01-DW02	CAA01-DW03
Sample ID					CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108
Sample Date					11/03/08	11/03/08	11/04/08
Chemical Name							
Cobalt, Dissolved	0.7	23.0	--	1.1	**1.5 J**	**1.4 J**	**3 J**
Iron, Dissolved	631	1,000	--	2,600	**1,760**	**261**	**4,150**
Lead, Dissolved	1.7	2.52	15	--	2.5 B	1.8 B	**1.8 J**
Magnesium, Dissolved	3,880	--	--	--	**2,200 J**	**6,800**	**2,480 J**
Manganese, Dissolved	49.5	120	--	88	**67.8**	**99.2**	**228**
Nickel, Dissolved	12.2	52.0	--	73	5.8 B	5.8 B	**19.6 J**
Potassium, Dissolved	1,710	--	--	--	**1,140 J**	**4,720 J**	**1,410 J**
Sodium, Dissolved	10,000	--	--	--	**6,340**	**7,940**	**8,300**
Vanadium, Dissolved	4.3	20.0	--	18	**2.9 J**	0.42 B	**1.3 J**
Zinc, Dissolved	--	118	--	1,100	12.9 B	5 B	**22.8 J**

Notes:

Exceeds Background

Exceeds BKG & ECO

Exceeds BKG & Tapwater RSL

Exceeds BKG, Tapwater RSL, & MCL

Exceeds BKG, ECO & Tapwater RSL

Exceeds BKG, ECO & MCL

Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UG/L - Micrograms per liter

TABLE 3-4
AOC 1 South Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15
Sample ID					CAA01-SS10-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108
Sample Date					11/07/08	11/07/08	11/07/08	11/07/08	11/07/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name									
Volatile Organic Compounds (UG/KG)									
2-Butanone	--	--	20,000,000	2,800,000	13 U	14 U	13 U	13 U	**8 J**
Acetone	--	--	63,000,000	6,100,000	3 B	9 B	14 B	10 B	95 B
Styrene	--	64,000	870,000	630,000	**33**	14 U	13 U	13 U	15 U
Toluene	--	40,000	820,000	500,000	13 U	14 U	**2 J**	13 U	15 U
Semivolatile Organic Compounds (UG/KG)									
Acenaphthylene	--	LMW PAH	3,300,000	340,000	410 U	460 U	420 U	460 U	**360 J**
Anthracene	--	LMW PAH	17,000,000	1,700,000	410 U	460 U	420 U	460 U	**800**
Benzo(a)anthracene	--	HMW PAH	2,100	150	410 U	460 U	420 U	460 U	**1,900**
Benzo(a)pyrene	--	HMW PAH	210	15	410 U	460 U	420 U	460 U	**1,500**
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	410 U	460 U	420 U	460 U	**1,400**
Benzo(g,h,i)perylene	--	HMW PAH	1,700,000	170,000	410 U	460 U	420 U	460 U	**820**
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	410 U	460 U	420 U	460 U	**1,100**
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	410 U	460 U	420 U	460 U	520 U
Carbazole	--	--	--	--	410 U	460 U	420 U	460 U	**610**
Chrysene	--	HMW PAH	210,000	15,000	410 U	460 U	420 U	460 U	**1,800**
Dibenz(a,h)anthracene	--	HMW PAH	210	15	410 U	460 U	420 U	460 U	**270 J**
Fluoranthene	--	LMW PAH	2,200,000	230,000	410 U	460 U	420 U	460 U	**4,900**
Fluorene	--	LMW PAH	2,200,000	230,000	410 U	460 U	420 U	460 U	**660**
Indeno(1,2,3-cd)pyrene	--	HMW PAH	2,100	150	410 U	460 U	420 U	460 U	**780**
PAH (HMW)	--	18,000	--	--	1,845 U	2,070 U	1,890 U	2,070 U	**13,970**
PAH (LMW)	--	29,000	--	--	1,845 U	2,070 U	1,890 U	2,070 U	**12,960**
Phenanthrene	--	LMW PAH	17,000,000	1,700,000	410 U	460 U	420 U	460 U	**5,200**
Pyrene	--	HMW PAH	1,700,000	170,000	410 U	460 U	420 U	460 U	**4,400**
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	--	583	7,200	2,000	4 U	4.3 U	**0.67 J**	**0.58 J**	**1 J**
4,4'-DDE	--	114	5,100	1,400	4 U	4.3 U	**0.43 J**	**0.56 J**	4.9 U
4,4'-DDT	--	100	7,000	1,700	4 U	4.3 U	**0.53 J**	**1.4 J**	4.9 U
Dieldrin	--	10.5	110	30	4 U	4.3 U	4.3 U	4.6 U	**0.46 J**
Endosulfan I	--	6.32	370,000	37,000	2 U	2.2 U	**0.29 J**	2.3 U	2.5 U
Endrin aldehyde	--	1.95	18,000	1,800	4 U	4.3 U	**1.9 J**	4.6 U	4.9 U
Explosives (UG/KG)									
No Detections									
Total Metals (MG/KG)									
Aluminum	12,200	pH < 5.5	99,000	7,700	**11,300**	**8,180**	**11,400**	**13,900**	**6,200**
Antimony	11	78.0	41	3.1	3.8 UL	4.5 UL	6.4 UL	**2 L**	**6.3 L**
Arsenic	6.36	18.0	1.6	0.39	**1.9**	**1.9**	**3.8**	**5.6**	**7.8**
Barium	52.9	330	19,000	1,500	**13.7**	**33.7**	**56.6**	**53.4**	**90.2**
Beryllium	0.587	40.0	200	16	**0.15 J**	**0.34 J**	**0.54**	**0.64**	**0.42 J**
Cadmium	1.5	32.0	80	7	0.32 U	**0.11 J**	**0.09 J**	**2**	**1.5**
Calcium	2,290	--	--	--	**1,020**	**1,470**	**6,690**	**11,600**	**11,900**
Chromium	18.2	64.0	5.6	0.29	**11.9**	**8.1**	**13.8**	**18.4**	**13.4**
Cobalt	9.93	13.0	30	2.3	**0.67 J**	**1.6 J**	**2.8 J**	**3.9 J**	**4.6 J**
Copper	4.25	70.0	4,100	310	**2.3**	**5.8**	**18.3**	**70**	**88.5**
Cyanide	--	15.8	2,000	160	0.55 U	0.6 U	0.6 U	0.65 U	**0.51 J**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**9,570**	**5,500**	**10,600**	**22,400**	**32,300**
Lead	17.4	120	800	400	**8.3**	**21.3**	**39.4**	**351**	**698**
Magnesium	1,070	--	--	--	**289 J**	**414**	**986**	**1,230**	**803 J**

TABLE 3-4
AOC 1 South Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15
Sample ID					CAA01-SS10-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108
Sample Date					11/07/08	11/07/08	11/07/08	11/07/08	11/07/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name									
Manganese	324	220	2,300	180	**17.4**	**179**	**384**	**281**	**394**
Mercury	0.111	0.10	31	2.3	0.11 U	0.09 B	**0.12**	0.08 B	**0.14 J**
Nickel	9.52	38.0	2,000	150	**1.6 J**	**3.3**	**5.9**	**8.5**	**12.9**
Potassium	708	--	--	--	**268 J**	**347 J**	**528 J**	**1,150**	**416 J**
Silver	2.1	560	510	39	**0.2 J**	**0.14 J**	**0.3 J**	0.9 U	**0.26 J**
Vanadium	27.9	130	520	39	**30**	**14**	**20.2**	**30**	**15.9**
Zinc	26.5	120	31,000	2,300	**6.8**	**26.3**	**55.2**	**162**	**477**
Wet Chemistry									
% Solids (pct)	--	--	--	--	**80**	**71**	**78**	**72**	**63**
pH (ph)	--	--	--	--	**5.7**	**6.7**	**7.8**	**7.9**	**6.6**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**1,200**	**31,000**	**29,000**	**64,000**	**140,000**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

LMW PAH - Low molecular weight Polycyclic Aromatic Hydrocarbons
HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 3-4
AOC 1 South Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID					CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date					12/18/08	12/18/08	12/18/08	12/17/08
Sample Depth					0-6"	0-6"	0-6"	0-6"
Chemical Name								
Volatile Organic Compounds (UG/KG)								
2-Butanone	--	--	20,000,000	2,800,000	17 U	**7 J**	**3 J**	13 U
Acetone	--	--	63,000,000	6,100,000	7 B	**34**	15 B	13 U
Styrene	--	64,000	870,000	630,000	17 U	16 U	15 U	13 U
Toluene	--	40,000	820,000	500,000	17 U	16 U	15 U	13 U
Semivolatile Organic Compounds (UG/KG)								
Acenaphthylene	--	LMW PAH	3,300,000	340,000	570 U	520 U	550 U	420 U
Anthracene	--	LMW PAH	17,000,000	1,700,000	570 U	520 U	550 U	420 U
Benzo(a)anthracene	--	HMW PAH	2,100	150	570 U	520 U	550 U	420 U
Benzo(a)pyrene	--	HMW PAH	210	15	570 U	520 U	550 U	420 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	570 U	520 U	550 U	420 U
Benzo(g,h,i)perylene	--	HMW PAH	1,700,000	170,000	570 U	520 U	550 U	420 U
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	570 U	520 U	550 U	420 U
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	**450 J**	520 U	550 U	**790**
Carbazole	--	--	--	--	570 U	520 U	550 U	420 U
Chrysene	--	HMW PAH	210,000	15,000	570 U	520 U	550 U	420 U
Dibenz(a,h)anthracene	--	HMW PAH	210	15	570 U	520 U	550 U	420 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	570 U	520 U	550 U	420 U
Fluorene	--	LMW PAH	2,200,000	230,000	570 U	520 U	550 U	420 U
Indeno(1,2,3-cd)pyrene	--	HMW PAH	2,100	150	570 U	520 U	550 U	420 U
PAH (HMW)	--	18,000	--	--	2,565 U	2,340 U	2,475 U	1,890 U
PAH (LMW)	--	29,000	--	--	2,565 U	2,340 U	2,475 U	1,890 U
Phenanthrene	--	LMW PAH	17,000,000	1,700,000	570 U	520 U	550 U	420 U
Pyrene	--	HMW PAH	1,700,000	170,000	570 U	520 U	550 U	420 U
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	--	583	7,200	2,000	**0.23 J**	4.9 U	5.4 U	4.2 U
4,4'-DDE	--	114	5,100	1,400	**0.34 J**	4.9 U	5.4 U	4.2 U
4,4'-DDT	--	100	7,000	1,700	**1.2 J**	4.9 U	5.4 U	4.2 U
Dieldrin	--	10.5	110	30	5.7 U	4.9 U	5.4 U	4.2 U
Endosulfan I	--	6.32	370,000	37,000	2.8 U	2.5 U	2.7 U	2.1 U
Endrin aldehyde	--	1.95	18,000	1,800	5.7 U	4.9 U	5.4 U	4.2 U
Explosives (UG/KG)								
No Detections								
Total Metals (MG/KG)								
Aluminum	12,200	pH < 5.5	99,000	7,700	**9,230**	**5,780**	**6,250**	**6,340**
Antimony	11	78.0	41	3.1	**1.6 L**	**0.1 L**	**0.12 L**	6.4 UL
Arsenic	6.36	18.0	1.6	0.39	**5.4**	**12**	**21.8**	**6.9**
Barium	52.9	330	19,000	1,500	**76.6**	**23.8 J**	**32.3**	**29.6**
Beryllium	0.587	40.0	200	16	**0.42 J**	**0.23 J**	**0.26 J**	**0.24 J**
Cadmium	1.5	32.0	80	7	**0.62 J**	**0.21 J**	**0.38 J**	**0.21 J**
Calcium	2,290	--	--	--	**9,560 J**	**4,920 J**	**5,590 J**	**2,680 J**
Chromium	18.2	64.0	5.6	0.29	**8.2**	**8.5**	**9.1**	**7.4**
Cobalt	9.93	13.0	30	2.3	**3.8 J**	**2.6 J**	**2.9 J**	**2.2 J**
Copper	4.25	70.0	4,100	310	**45.8**	**4.4**	**5.5**	**7.4**
Cyanide	--	15.8	2,000	160	**0.4 L**	0.75 UL	0.8 UL	0.6 UL
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**14,700**	**12,900**	**18,900**	**9,550**
Lead	17.4	120	800	400	**151**	**11.2**	**14.1**	**10.3**
Magnesium	1,070	--	--	--	**609 J**	**350 J**	**442 J**	**365 J**

TABLE 3-4
AOC 1 South Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID					CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date					12/18/08	12/18/08	12/18/08	12/17/08
Sample Depth					0-6"	0-6"	0-6"	0-6"
Chemical Name								
Manganese	324	220	2,300	180	**285**	**98.1**	**145**	**358**
Mercury	0.111	0.10	31	2.3	**0.11 L**	0.15 UL	0.18 UL	0.12 UL
Nickel	9.52	38.0	2,000	150	**6.1 J**	**3.5 J**	**3.9 J**	**3.1 J**
Potassium	708	--	--	--	**378 J**	**331 J**	**371 J**	**336 J**
Silver	2.1	560	510	39	**0.15 J**	1.3 U	1.5 U	**0.18 J**
Vanadium	27.9	130	520	39	**13.8**	**14.4**	**15.8**	**10.6**
Zinc	26.5	120	31,000	2,300	**115**	**100**	**157**	**63.7**
Wet Chemistry								
% Solids (pct)	--	--	--	--	**59**	**68**	**62**	**80**
pH (ph)	--	--	--	--	**7.5**	**7.5**	**7.6**	**7.8**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**110,000**	**38,000**	**77,000**	**15,000**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher
U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

LMW PAH - Low molecular weight Polycyclic Aromatic Hydrocarbons
HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 3-5
AOC 1 South Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Dec. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Dec. 2010)**	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID					CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date					11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Sample Depth					6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"
Chemical Name													
Volatile Organic Compounds (UG/KG)													
2-Butanone	--	--	20,000,000	2,800,000	12 U	10 U	13 U	12 U	12 U	13 U	**8 J**	**9 J**	14 U
Acetone	--	--	63,000,000	6,100,000	2 B	18 B	12 B	12 U	9 B	13 U	**48**	**41**	14 U
Carbon disulfide	--	--	370,000	82,000	12 U	10 U	13 U	12 U	12 U	13 U	**2 J**	**1 J**	14 U
Semivolatile Organic Compounds (UG/KG)													
Benzo(a)pyrene	--	HMW PAH	210	15	420 U	350 U	440 U	400 U	410 UJ	**220 J**	450 U	450 U	470 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	420 U	350 U	440 U	400 U	410 UJ	**290 J**	450 U	450 U	470 U
Benzo(g,h,i)perylene	--	HMW PAH	1,700,000	170,000	420 U	350 U	440 U	400 U	410 UJ	**350 J**	450 U	450 U	470 U
bis(2-Ethylhexyl)phthalate	--	--	120,000	35,000	420 U	350 U	440 U	400 U	**210 J**	440 U	450 U	450 U	470 U
Indeno(1,2,3-cd)pyrene	--	HMW PAH	2,100	150	420 U	350 U	440 U	400 U	410 UJ	**270 J**	450 U	450 U	470 U
PAH (HMW)	--	18,000	--	--	1,890 U	1,575 U	1,980 U	1,800 U	1,845 U	**2,230 J**	2,025 U	2,025 U	2,115 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	--	583	7,200	2,000	3.8 U	3.5 U	**0.27 J**	4.3 U	4.3 U	**0.48 J**	4.3 U	4.5 U	4.2 U
4,4'-DDE	--	114	5,100	1,400	3.8 U	3.5 U	**0.22 J**	4.3 U	**0.28 J**	**0.28 J**	4.3 U	4.5 U	4.2 U
4,4'-DDT	--	100	7,000	1,700	3.8 U	3.5 U	**0.48 J**	4.3 U	4.3 U	**0.45 J**	4.3 U	4.5 U	4.2 U
Explosives (UG/KG)													
No Detections													
Total Metals (MG/KG)													
Aluminum	13,000	pH < 5.5	99,000	7,700	**15,100**	**4,220**	**9,950**	**10,900**	**8,880**	**6,890**	**8,150**	**8,580**	**8,120**
Antimony	--	78.0	41	3.1	**0.32 L**	4 UL	7.1 UL	**0.49 L**	**46.1 L**	**1.7 L**	**0.21 L**	**0.32 L**	**0.37 L**
Arsenic	5.54	18.0	1.6	0.39	**5.8**	**1.5**	**2.6**	**3.9**	**17.4**	**5.2**	**14.1**	**6.7**	**7**
Barium	84.5	330	19,000	1,500	**25.7**	**20.5**	**40.2**	**41**	**52.6**	**61.6**	**19.1 J**	**21.4 J**	**32**
Beryllium	0.52	40.0	200	16	**0.49**	**0.29 J**	**0.59 J**	**0.58**	**0.49 J**	**0.41 J**	**0.2 J**	**0.22 J**	**0.34 J**
Cadmium	--	32.0	80	7	0.72 U	0.03 B	0.04 B	**0.15 J**	**4**	**0.45 J**	**0.34 J**	**0.3 J**	**0.2 J**
Calcium	2,380	--	--	--	**1,160**	**364**	**1,920**	**20,700**	**27,100**	**26,600 J**	**4,190 J**	**5,130 J**	**4,080 J**
Chromium	33.7	64.0	5.6	0.29	**22.8**	**4**	**8.2**	**14.5**	**27.6**	**13.5**	**10.4**	**11.5**	**9.3**
Cobalt	5.18	13.0	30	2.3	**3.7 J**	**1.3 J**	**2.5 J**	**3.2 J**	**7.3 J**	**3.2 J**	**4.7 J**	**3 J**	**2.9 J**
Copper	3.17	70.0	4,100	310	**7.7**	**1.4 J**	**9.1**	**12.6**	**105**	**61.5**	**3.9**	**6**	**20.8**
Cyanide	2.7	15.8	2,000	160	0.6 U	0.5 U	0.6 U	0.6 U	**0.3 J**	0.65 UL	0.7 UL	0.6 UL	0.7 UL
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**28,500**	**2,250**	**5,140**	**16,300**	**43,300**	**16,700**	**9,790**	**10,200**	**11,600**
Lead	8.79	120	800	400	**93.7**	**5.7**	**14.4**	**38.6**	**3,360**	**283**	**9.6**	**11**	**19.5**
Magnesium	1,120	--	--	--	**700 J**	**170 J**	**568 J**	**1,460**	**1,450**	**1,160**	**783**	**348 J**	**423 J**
Manganese	176	220	2,300	180	**46.1**	**68.4**	**231**	**139**	**300**	**146**	**57.7**	**91.9**	**283**
Nickel	17.6	38.0	2,000	150	**8.2**	**1.9 J**	**4.3 J**	**5.8**	**23**	**8.4**	**4.4 J**	**4.1 J**	**4.2 J**
Potassium	901	--	--	--	**836**	**126 J**	**307 J**	**824**	**495 J**	**364 J**	**344 J**	**398 J**	**413 J**
Silver	1.1	560	510	39	1.4 U	0.68 U	**0.11 J**	0.9 U	2.1 U	1 U	1.2 U	1.3 U	**0.26 J**
Sodium	811	--	--	--	25.7 B	10.2 B	25.4 B	46.7 B	59.2 B	**41.5 J**	23.1 B	**31.5 J**	**42.5 J**
Vanadium	48.3	130	520	39	**35.4**	**6.2**	**12.2**	**20.6**	**16.9**	**12.8**	**17.6**	**18.5**	**13.6**
Zinc	28	120	31,000	2,300	**21.6**	**5.2**	**19.5**	**30.4**	**1,130**	**120**	**352**	**165**	**92.8**
Wet Chemistry													
% Solids (pct)	--	--	--	--	**79**	**94**	**75**	**82**	**80**	**74**	**77**	**73**	**80**
pH (ph)	--	--	--	--	**6.9**	**7.6**	**7.4**	**6.7**	**7.8**	**8.2**	**7.6**	**7.3**	**7.8**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**4,600**	**5,800**	**10,000**	**3,300**	**32,000**	**43,000**	**16,000**	**7,600**	**18,000**

TABLE 3-5
AOC 1 South Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Dec. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Dec. 2010)**	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID					CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date					11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Sample Depth					6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"
Chemical Name													

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 3-6
AOC 1 South Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW CC AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater (Nov. 2010)	CLEAN RSLs Tapwater Adjusted (Nov. 2010)	CAA01-DW04		CAA01-DW05	
Sample ID					CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208
Sample Date					11/05/08	11/05/08	12/18/08	12/18/08
Chemical Name								
Volatile Organic Compounds (UG/L)								
Acetone	--	1,500	--	2,200	**2 J**	**2 J**	4 B	4 B
Semivolatile Organic Compounds (UG/L)								
2-Methylnaphthalene	--	330	--	15	10 U	9 U	9 U	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)								
No Detections								
Explosives (UG/L)								
No Detections								
Total Metals (UG/L)								
Aluminum	2,230	87.0	--	3,700	**102,000**	**114,000**	**1,280**	**1,000**
Antimony	18.8	30.0	6	1.5	60 R	60 R	**1 J**	**1.1 J**
Arsenic	2.28	150	10	0.045	**45.2**	**46.6**	12.1 B	11.4 B
Barium	118	4.00	2,000	730	**337**	**365**	**104 J**	**101 J**
Beryllium	2.45	0.66	4	7.3	**2.3 J**	**2.6 J**	5 U	5 U
Cadmium	0.605	0.27	5	1.8	**1.7 J**	**1.5 J**	0.13 B	0.08 B
Calcium	158,000	--	--	--	**138,000**	**137,000**	**180,000**	**178,000**
Chromium	15.1	11.4	100	0.043	**127**	**139**	**2 J**	**1.6 J**
Cobalt	20.6	23.0	--	1.1	**15.8 J**	**16.8 J**	0.3 B	0.39 B
Copper	12.2	9.33	1,300	150	**43.4**	**49.2**	**8.8 J**	**10.3 J**
Iron	3,590	1,000	--	2,600	**104,000**	**111,000**	**18,000**	**17,700**
Lead	21.3	3.18	15	--	**82.7**	**93.8**	**3.9 J**	**3.8 J**
Magnesium	3,600	--	--	--	**10,700**	**11,100**	**7,080**	**6,920**
Manganese	57.9	120	--	88	**791**	**805**	**778**	**769**
Mercury	0.081	0.91	2	1.1	**0.18 J**	**0.15 J**	0.2 UL	0.2 UL
Nickel	11.4	52.2	--	73	**56.7**	**61.1**	**1 J**	**0.9 J**
Potassium	3,490	--	--	--	**6,590**	**6,680**	**2,670 J**	**2,550 J**
Selenium	--	5.00	50	18	35 U	**1 J**	35 U	35 U
Sodium	9,920	--	--	--	**8,010**	**7,660**	**8,680**	**8,650**
Vanadium	26.2	20.0	--	18	**164**	**175**	**1.9 J**	**1.1 J**
Zinc	4.52	120	--	1,100	**205**	**215**	**13.3 J**	**9.6 J**
Dissolved Metals (UG/L)								
Aluminum, Dissolved	100	87.0	--	3,700	**167 J**	**178 J**	73.2 B	68.4 B
Antimony, Dissolved	9.7	30.0	6	1.5	60 U	60 U	60 U	**0.88 J**
Arsenic, Dissolved	1.37	150	10	0.045	**25.4**	**25**	**10.6**	9.2 B
Barium, Dissolved	127	4.00	2,000	730	**87.5 J**	**85 J**	**94.7 J**	**92.3 J**
Calcium, Dissolved	148,000	--	--	--	**141,000**	**140,000**	**175,000**	**175,000**
Chromium, Dissolved	6.04	11.0	100	0.043	10 U	10 U	10 U	**0.42 J**
Cobalt, Dissolved	0.7	23.0	--	1.1	**0.52 J**	**0.32 J**	50 U	0.29 B
Copper, Dissolved	3	8.96	1,300	150	1 B	1.3 B	**1.4 J**	**2 J**

TABLE 3-6

AOC 1 South Groundwater Detection and Exceedance Results

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW CC AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Nov. 2010)**	**CLEAN RSLs Tapwater Adjusted (Nov. 2010)**	CAA01-DW04		CAA01-DW05	
Sample ID					CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208
Sample Date					11/05/08	11/05/08	12/18/08	12/18/08
Chemical Name								
Iron, Dissolved	631	1,000	--	2,600	**49,100**	**48,600**	**16,300**	**14,000**
Lead, Dissolved	1.7	2.52	15	--	2.2 B	**1.7 J**	**1 J**	10 U
Magnesium, Dissolved	3,880	--	--	--	**6,940**	**6,840**	**6,760**	**6,730**
Manganese, Dissolved	49.5	120	--	88	**685**	**680**	**749**	**749**
Nickel, Dissolved	12.2	52.0	--	73	**13.6 J**	**12.4 J**	40 U	**0.53 J**
Potassium, Dissolved	1,710	--	--	--	**3,200 J**	**3,080 J**	**2,510 J**	**2,500 J**
Silver, Dissolved	--	0.36	--	18	0.43 B	10 U	10 U	**0.34 J**
Sodium, Dissolved	10,000	--	--	--	**8,080**	**7,880**	**8,490**	**8,440**
Vanadium, Dissolved	4.3	20.0	--	18	**0.54 J**	**0.6 J**	50 U	50 U
Zinc, Dissolved	--	118	--	1,100	**82.6**	**78**	**2.7 J**	**2.8 J**

Notes:

Exceeds Background

Exceeds BKG & ECO

Exceeds BKG, Tapwater RSL, & MCL

Exceeds BKG, ECO & Tapwater RSL

Exceeds BKG, ECO & MCL

Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

-- No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - Analyte not detected

UL - Analyte not detected, quantitaion limit is probably higher

UG/L - Micrograms per liter

TABLE 3-6
AOC 1 South Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW CC AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Nov. 2010)**	**CLEAN RSLs Tapwater Adjusted (Nov. 2010)**	CAA01-DW06	CAA01-DW07
Sample ID					CAA01-DW06-1208	CAA01-DW07-1208
Sample Date					12/18/08	12/19/08
Chemical Name						
Volatile Organic Compounds (UG/L)						
Acetone	--	1,500	--	2,200	3 B	2 B
Semivolatile Organic Compounds (UG/L)						
2-Methylnaphthalene	--	330	--	15	**7 J**	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)						
No Detections						
Explosives (UG/L)						
No Detections						
Total Metals (UG/L)						
Aluminum	2,230	87.0	--	3,700	**1,440**	**147 J**
Antimony	18.8	30.0	6	1.5	**1.7 J**	60 U
Arsenic	2.28	150	10	0.045	4.2 B	10.5 B
Barium	118	4.00	2,000	730	**33.9 J**	**59.4 J**
Beryllium	2.45	0.66	4	7.3	5 U	5 U
Cadmium	0.605	0.27	5	1.8	0.07 B	0.07 B
Calcium	158,000	--	--	--	**103,000**	**126,000**
Chromium	15.1	11.4	100	0.043	10 U	**0.58 J**
Cobalt	20.6	23.0	--	1.1	0.43 B	0.87 B
Copper	12.2	9.33	1,300	150	**3.4 J**	**1.1 J**
Iron	3,590	1,000	--	2,600	21.6 B	**2,720**
Lead	21.3	3.18	15	--	**1.1 J**	**1.5 J**
Magnesium	3,600	--	--	--	**1,860 J**	**3,470 J**
Manganese	57.9	120	--	88	**6.2 J**	**320**
Mercury	0.081	0.91	2	1.1	0.2 UL	0.2 UL
Nickel	11.4	52.2	--	73	**2.8 J**	**0.45 J**
Potassium	3,490	--	--	--	**3,310 J**	**1,650 J**
Selenium	--	5.00	50	18	35 U	35 U
Sodium	9,920	--	--	--	**7,060**	**5,790**
Vanadium	26.2	20.0	--	18	**1.4 J**	50 U
Zinc	4.52	120	--	1,100	**3.1 J**	**3.4 J**
Dissolved Metals (UG/L)						
Aluminum, Dissolved	100	87.0	--	3,700	**513**	**134 J**
Antimony, Dissolved	9.7	30.0	6	1.5	**2.5 J**	60 U
Arsenic, Dissolved	1.37	150	10	0.045	4.3 B	9.2 B
Barium, Dissolved	127	4.00	2,000	730	**192 J**	**54.2 J**
Calcium, Dissolved	148,000	--	--	--	**474,000**	**138,000**
Chromium, Dissolved	6.04	11.0	100	0.043	**0.58 J**	**0.48 J**
Cobalt, Dissolved	0.7	23.0	--	1.1	0.25 B	0.32 B
Copper, Dissolved	3	8.96	1,300	150	**6.4 J**	25 U

TABLE 3-6

AOC 1 South Groundwater Detection and Exceedance Results

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW CC AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Nov. 2010)**	**CLEAN RSLs Tapwater Adjusted (Nov. 2010)**	CAA01-DW06	CAA01-DW07
Sample ID					CAA01-DW06-1208	CAA01-DW07-1208
Sample Date					12/18/08	12/19/08
Chemical Name						
Iron, Dissolved	631	1,000	--	2,600	100 U	**3,500**
Lead, Dissolved	1.7	2.52	15	--	**2.9 J**	**1.2 J**
Magnesium, Dissolved	3,880	--	--	--	**10.7 J**	**3,510 J**
Manganese, Dissolved	49.5	120	--	88	15 U	**306**
Nickel, Dissolved	12.2	52.0	--	73	**10.6 J**	**0.71 J**
Potassium, Dissolved	1,710	--	--	--	**8,120**	**1,500 J**
Silver, Dissolved	--	0.36	--	18	10 U	10 U
Sodium, Dissolved	10,000	--	--	--	**14,000**	**6,240**
Vanadium, Dissolved	4.3	20.0	--	18	**0.58 J**	**0.44 J**
Zinc, Dissolved	--	118	--	1,100	**2.3 J**	**2.9 J**

Notes:

Exceeds Background

Exceeds BKG & ECO

Exceeds BKG, Tapwater RSL, & MCL

Exceeds BKG, ECO & Tapwater RSL

Exceeds BKG, ECO & MCL

Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

-- No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - Analyte not detected

UL - Analyte not detected, quantitaion limit is probably higher

UG/L - Micrograms per liter

TABLE 3-7
AOC 1 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a	Step 2b	Step 3
	Site Potentially CERCLA-eligible?	Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?	Exceedances of Comparison Criteria?	Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Is Further Investigation or Action Required?
AOC 1 North Surface Soil	Yes	VOCs	Yes	No	N/A	Yes - an Expanded SI for AOC 1 North is recommended to further verify and characterize the extent of SVOC (PAH) and inorganic contamination in the localized surface soil "hot spot" areas. Specifically: 1. Collect surface soil and analyze for SVOCs (PAHs) and inorganics. In addition, analyze two of the samples for hexavalent chromium for chromium speciation. 2. Install permanent monitoring wells, collect groundwater, and analyze for total and dissolved inorganics. Additionally, verify the groundwater flow direction. Note: No further investigation of subsurface soil is recommended.
		SVOCs	Yes	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risk only). Also, benzaldehyde was identified as an initial eco COPC since it did not have an available screening value.	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risk only)	
		Pesticides	Yes	Yes - 2 pesticides (endrin, endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (Al, As, Mn - potential HH and eco risks; Cr, V - potential HH risk; CN, Pb, Hg, Zn - potential eco risk)	Yes - 3 inorganics (As and Cr - potential HH risk and Zn - potential eco risk)	
AOC 1 North Subsurface Soil	Yes	VOCs	Yes	No; however, 2-butanone was identified as an initial eco COPC since no screening value was available	N/A	
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 3 inorganics (Al - potential HH and eco risks; As, Co - potential HH risks)	No, based on results of HH and eco risk screenings	
AOC 1 North Groundwater	Yes	VOCs	Yes	No	N/A	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 16 total inorganics (Al, As, Ba, Be, Cr, Co, Cu, Fe, Pb, Mn, Ni, Se, V - potential HH and eco risks; Cd, Hg, and Zn - potential eco risk) and 5 dissolved inorganics (As, Co - HH qualitative review only[1] ; Fe, Mn - HH qualitative review[1] and potential eco risk; Al - potential eco risk)	Yes - 12 total inorganics (Al, As, Ba, Be, Cr, Co, Cu, Fe, Pb, Mn, Se, V - potential HH risk only)	

[1]Although total (unfiltered) and dissolved (filtered) groundwater samples were collected, only total sample data were analyzed in the human health risk screening evaluation; analytical data from the dissolved groundwater samples were reviewed for qualitative purposes only.

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 3-7
AOC 1 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a	Step 2b	Step 3
	Site Potentially CERCLA-eligible?	Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?	Exceedances of Comparison Criteria?	Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Is Further Investigation or Action Required?
AOC 1 South Surface Soil	Yes	VOCs	Yes	No; however, 2 VOCs (2-butanone, acetone) were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	Yes - an Expanded SI of AOC 1 South is recommended to further verify and characterize the extent of SVOC (PAH) and inorganic contamination in the localized surface and subsurface "hot spot" areas. Specifically: 1. Collect surface and subsurface soil and analyze for SVOCs (PAHs) and inorganics. No chromium speciation analysis for soil is necessary because the SI concentrations are within background. 2. Install permanent monitoring wells, collect groundwater, and analyze for total and dissolved inorganics. Additionally, verify the groundwater flow direction. 3. Collect surface water and sediment and analyze for SVOCs (PAHs) and inorganics to determine if there has been an impact to these media.
		SVOCs	Yes	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risk only). Also, carbazole was identified as an initial eco COPC since it did not have an available screening value.	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risk only)	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (As, Mn - potential HH and eco risks; Al, Cr, Fe - potential HH risk; Cu, Pb, Hg, Zn - potential eco risk)	Yes - 5 inorganics (As and Cr - potential HH risk and Pb, Mn, Zn - potential eco risk)	
AOC 1 South Subsurface Soil	Yes	VOCs	Yes	No; however, 3 VOCs (2-butanone, carbon disulfide, acetone) were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	
		SVOCs	Yes	Yes - 3 SVOCs (benzo(a)pyrene, benzo(b)fluoranthene,ideno(1,2,3-cd)pyrene - potential HH risk only)	No, based on results of HH risk screening	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (Fe, Pb, Mn - potential HH and eco risks; Al, Sb, As, Co - potential HH risk]; Cu, Zn - potential eco risk])	Yes - 4 inorganics (Sb and Pb - potential HH risk and Pb and Zn - potential eco risk)	
AOC 1 South Groundwater	Yes	VOCs	Yes	No	N/A	
		SVOCs	Yes	No	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 13 total inorganics (Al, Cr, Fe, Pb, Mn, V - potential HH and eco risks; As - potential HH risk; Ba, Be, Cd, Cu, Ni, Zn - potential eco risk) and 6 dissolved inorganics (As - HH qualitative review only[1]; Fe, Mn - HH qualitative review[1] and potential eco risk; Al, Ba, Pb - potential eco risk)	Yes - 7 total inorganics (Al, As, Cr, Fe, Pb, Mn, V - potential HH risk) and 1 dissolved inorganic (Fe - potential eco risk)	

[1]Although total (unfiltered) and dissolved (filtered) groundwater samples were collected, only total sample data were analyzed in the human health risk screening evaluation; analytical data from the dissolved groundwater samples were reviewed for qualitative purposes only.

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

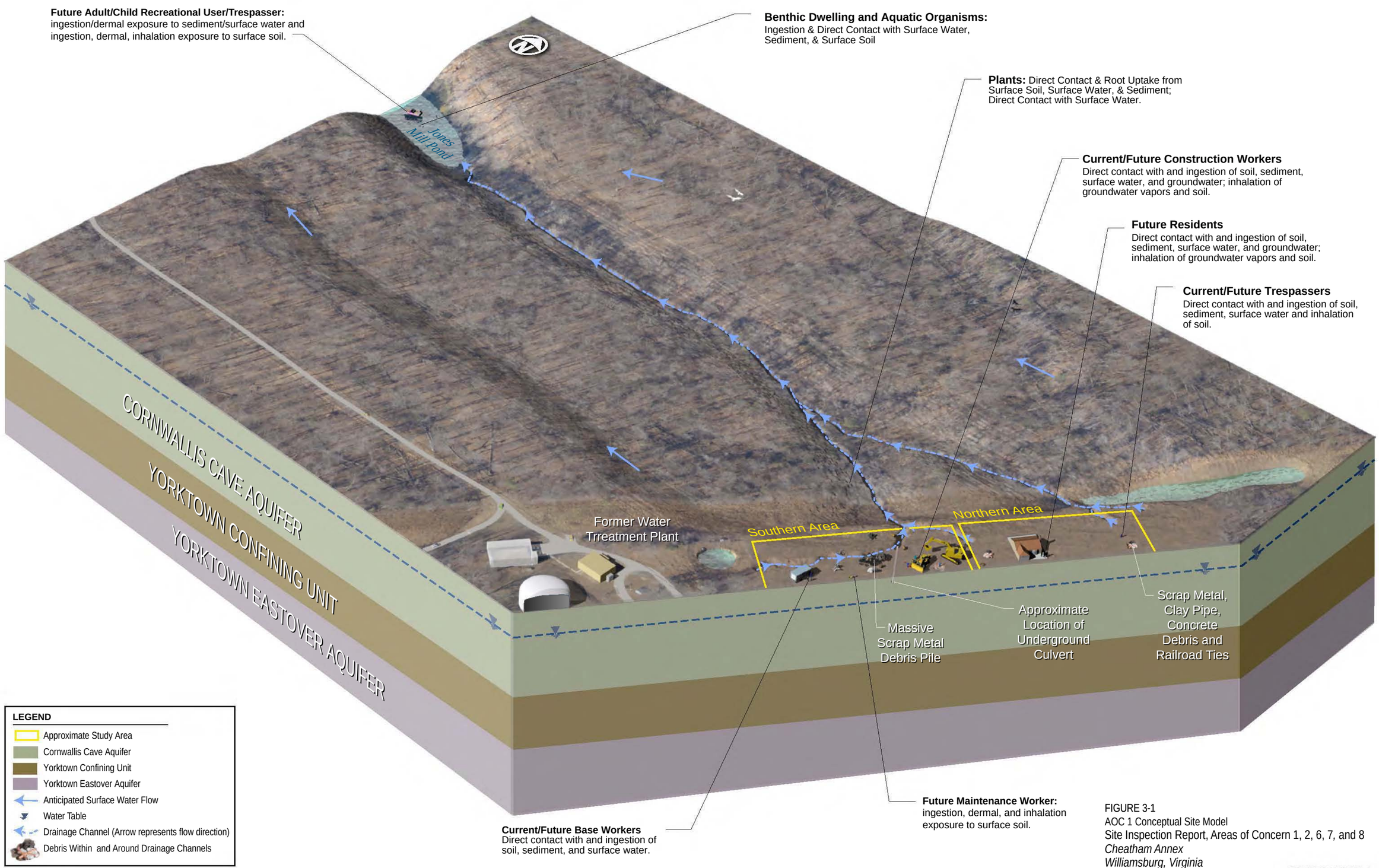

FIGURE 3-1
AOC 1 Conceptual Site Model
Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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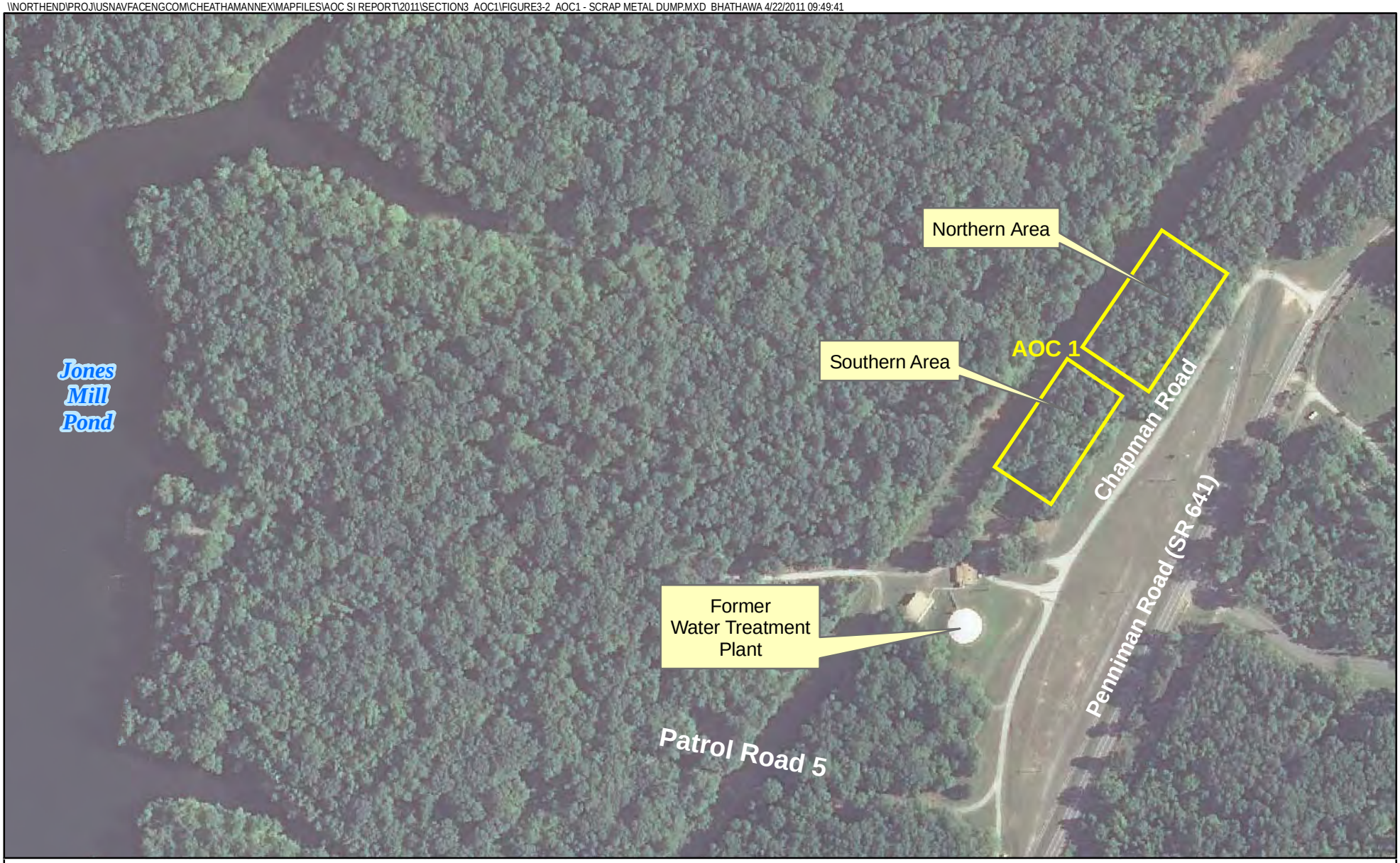
ES033011003122VBO CSMCAXAOC_Fig3-1_CMS_Site_AOC1_rev1.ai 04/05/11 LED

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION3 AOC1\FIGURE3-2 AOC1 - SCRAP METAL DUMP.MXD BHATHAWA 4/22/2011 09:49:41



Legend

Approximate Study Area Boundary

N
W E
S

0 150 300
Feet

Figure 3-2
AOC 1 Scrap Metal Dump and Vicinity Detail
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION3 AOC1\FIGURE3-3 - AOC1 - SI SAMPLE LOCATIONS.MXD BHATHAWA 4/22/2011 10:08:08

Legend

- Groundwater/Soil Sample Location
- Soil Sample Location
- Approximate Tripod Groundwater/Soil Sample Location
- Approximate AOC 1 Study Area
- Topographic Surface Contour (feet above mean sea level)
- Railroad tracks
- Tree line
- Drainage Channel (arrow represents flow direction)

N
W E
S

0 60 120
Feet

Figure 3-3
AOC 1 Comprehensive Investigation Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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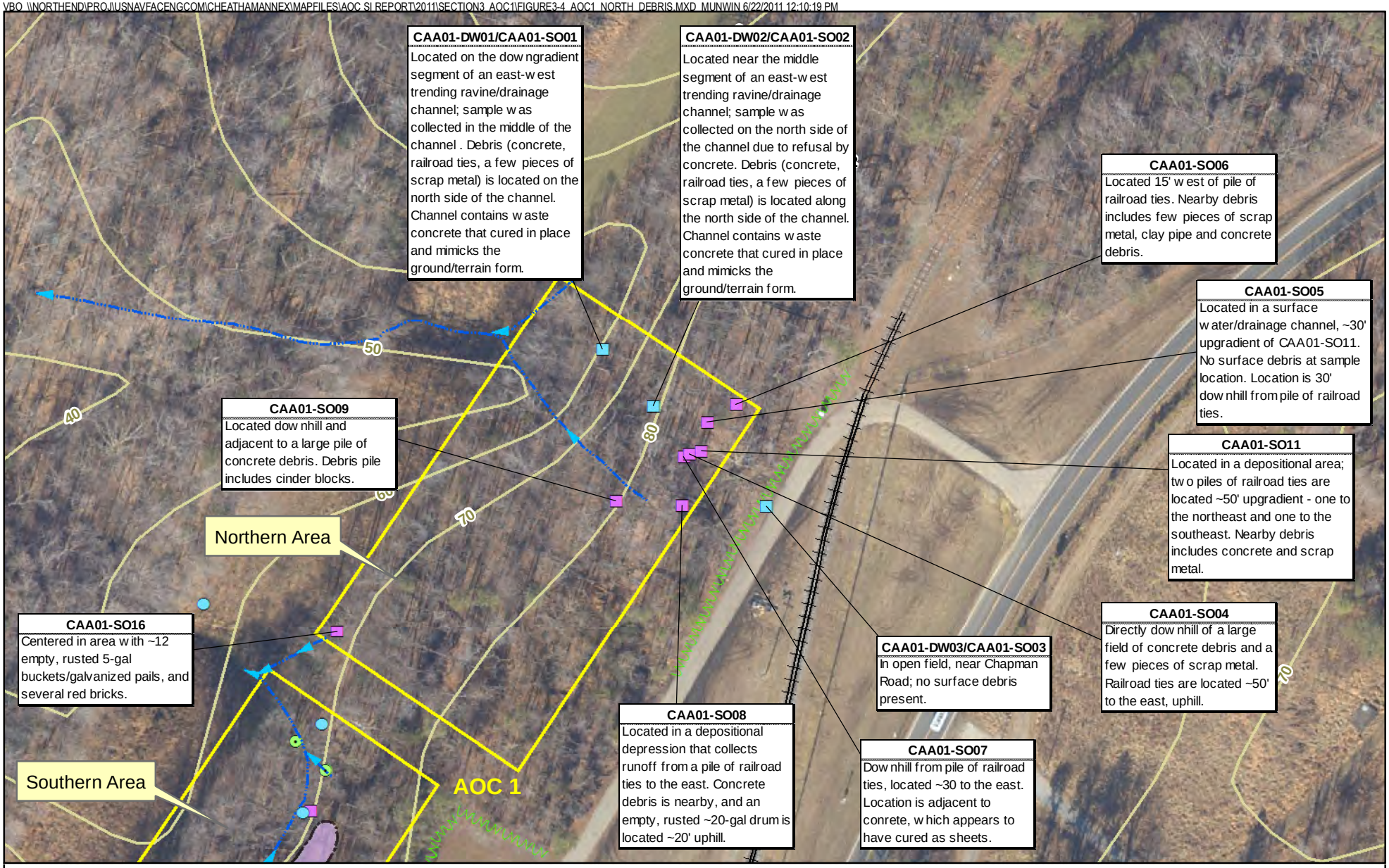
VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION3_AOC1\FIGURE3-4_AOC1_NORTH_DEBRIS.MXD MUNWIN 6/22/2011 12:10:19 PM



Legend

- Groundwater/Soil Sample Location
- Soil Sample Location
- Approximate Tripod Groundwater/Soil Sample Location
- Approximate AOC 1 Study Area
- Approximate boundary of massive scrap metal debris pile
- Topographic Surface Contour (feet above mean sea level)
- Railroad tracks
- Tree line
- Drainage Channel (arrow represents flow direction)
- 55-gallon, empty, rusted drum

N W E S

0 50 100 Feet

Figure 3-4
AOC 1 North Debris Near SI Sample Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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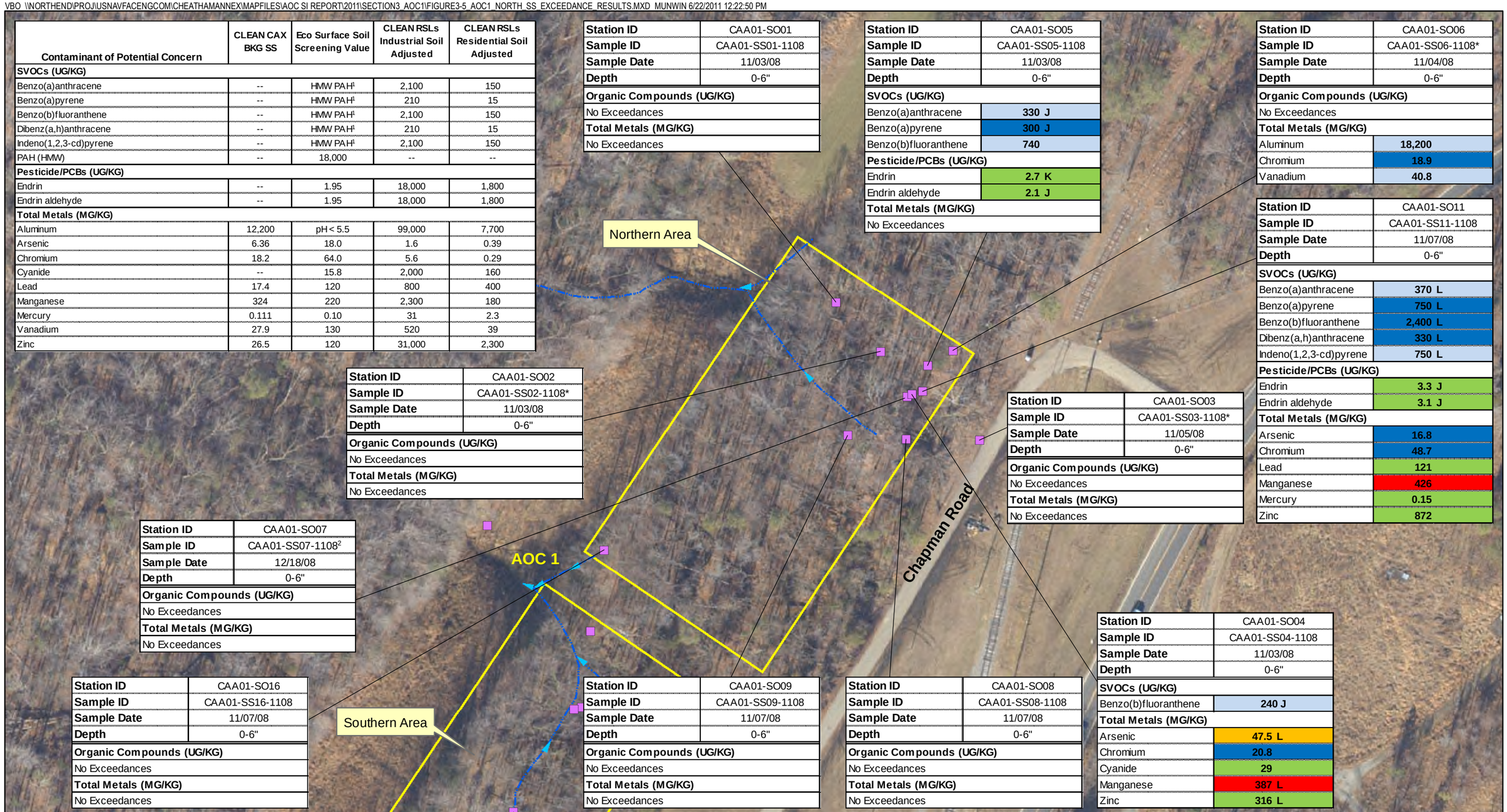

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
SVOCs (UG/KG)				
Benzo(a)anthracene	--	HMW PAH[1]	2,100	150
Benzo(a)pyrene	--	HMW PAH[1]	210	15
Benzo(b)fluoranthene	--	HMW PAH[1]	2,100	150
Dibenz(a,h)anthracene	--	HMW PAH[1]	210	15
Indeno(1,2,3-cd)pyrene	--	HMW PAH[1]	2,100	150
PAH (HMW)	--	18,000	--	--
Pesticide/PCBs (UG/KG)				
Endrin	--	1.95	18,000	1,800
Endrin aldehyde	--	1.95	18,000	1,800
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Cyanide	--	15.8	2,000	160
Lead	17.4	120	800	400
Manganese	324	220	2,300	180
Mercury	0.111	0.10	31	2.3
Vanadium	27.9	130	520	39
Zinc	26.5	120	31,000	2,300

Station ID	CAA01-SO01
Sample ID	CAA01-SS01-1108
Sample Date	11/03/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO05
Sample ID	CAA01-SS05-1108
Sample Date	11/03/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	330 J
Benzo(a)pyrene	300 J
Benzo(b)fluoranthene	740
Pesticide/PCBs (UG/KG)	
Endrin	2.7 K
Endrin aldehyde	2.1 J
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO06
Sample ID	CAA01-SS06-1108*
Sample Date	11/04/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	18,200
Chromium	18.9
Vanadium	40.8

Station ID	CAA01-SO11
Sample ID	CAA01-SS11-1108
Sample Date	11/07/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	370 L
Benzo(a)pyrene	750 L
Benzo(b)fluoranthene	2,400 L
Dibenz(a,h)anthracene	330 L
Indeno(1,2,3-cd)pyrene	750 L
Pesticide/PCBs (UG/KG)	
Endrin	3.3 J
Endrin aldehyde	3.1 J
Total Metals (MG/KG)	
Arsenic	16.8
Chromium	48.7
Lead	121
Manganese	426
Mercury	0.15
Zinc	872

Station ID	CAA01-SO02
Sample ID	CAA01-SS02-1108*
Sample Date	11/03/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO03
Sample ID	CAA01-SS03-1108*
Sample Date	11/05/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO07
Sample ID	CAA01-SS07-1108[2]
Sample Date	12/18/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO04
Sample ID	CAA01-SS04-1108
Sample Date	11/03/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(b)fluoranthene	240 J
Total Metals (MG/KG)	
Arsenic	47.5 L
Chromium	20.8
Cyanide	29
Manganese	387 L
Zinc	316 L

Station ID	CAA01-SO16
Sample ID	CAA01-SS16-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO09
Sample ID	CAA01-SS09-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO08
Sample ID	CAA01-SS08-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Legend

- Soil Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO & Res RSL
- Exceeds BKG, Res & Ind RSLs
- Exceeds BKG, ECO, Res & Ind RSLs

[1]No value for the individual PAH was used; the constituent was evaluated as part of the total PAH (HMW) evaluation
[2]Sample re-collected on 12/18/08 and analyzed for pesticides/PCBs since these analyses were inadvertently omitted when the sample collected on 11/5/08 was analyzed
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

-- - No value available
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N
W E
S

0 80 160
Feet

Figure 3-5
AOC 1 North Surface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Arsenic	5.54	18.0	1.6	0.39
Cobalt	5.18	13.0	30	2.3

Station ID	CAA01-SO01
Sample ID	CAA01-SB01-1108
Sample Date	11/03/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO02
Sample ID	CAA01-SB02-1108*
Sample Date	11/03/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	**6.8 L**
Cobalt	**8.4 J**

Station ID	CAA01-SO06
Sample ID	CAA01-SB06-1108*
Sample Date	11/04/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	**19,200**

Station ID	CAA01-SO07
Sample ID	CAA01-SB07-1108[1]
Sample Date	11/05/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Cobalt	**6.7**

Station ID	CAA01-SO05
Sample ID	CAA01-SB05-1108
Sample Date	11/03/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

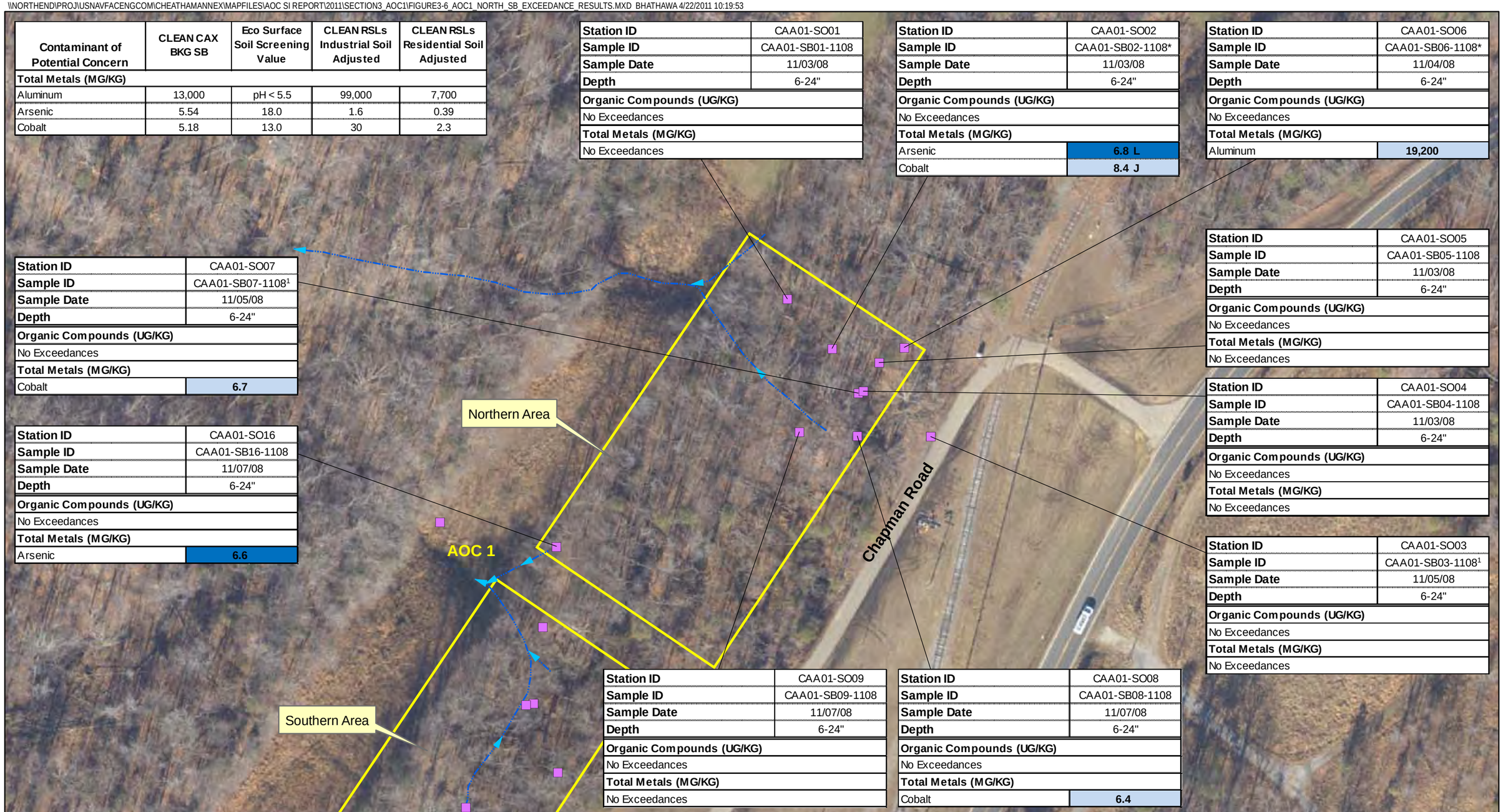
Station ID	CAA01-SO04
Sample ID	CAA01-SB04-1108
Sample Date	11/03/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO16
Sample ID	CAA01-SB16-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	**6.6**

Station ID	CAA01-SO03
Sample ID	CAA01-SB03-1108[1]
Sample Date	11/05/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO09
Sample ID	CAA01-SB09-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO08
Sample ID	CAA01-SB08-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Cobalt	**6.4**



Legend

- Soil Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary

Notes:
Sample CAA01-SB11 was not collected due to refusal from concrete debris.
Exceeds BKG and Res RSL
Exceeds BKG, Res and Ind RSLs
[1]Sample re-collected on 12/18/08 and analyzed for pesticides/PCBs since these analyses were inadvertently omitted when the sample collected on 11/5/08 was analyzed
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N
W E
S

0 80 160
Feet

Figure 3-6
AOC 1 North Subsurface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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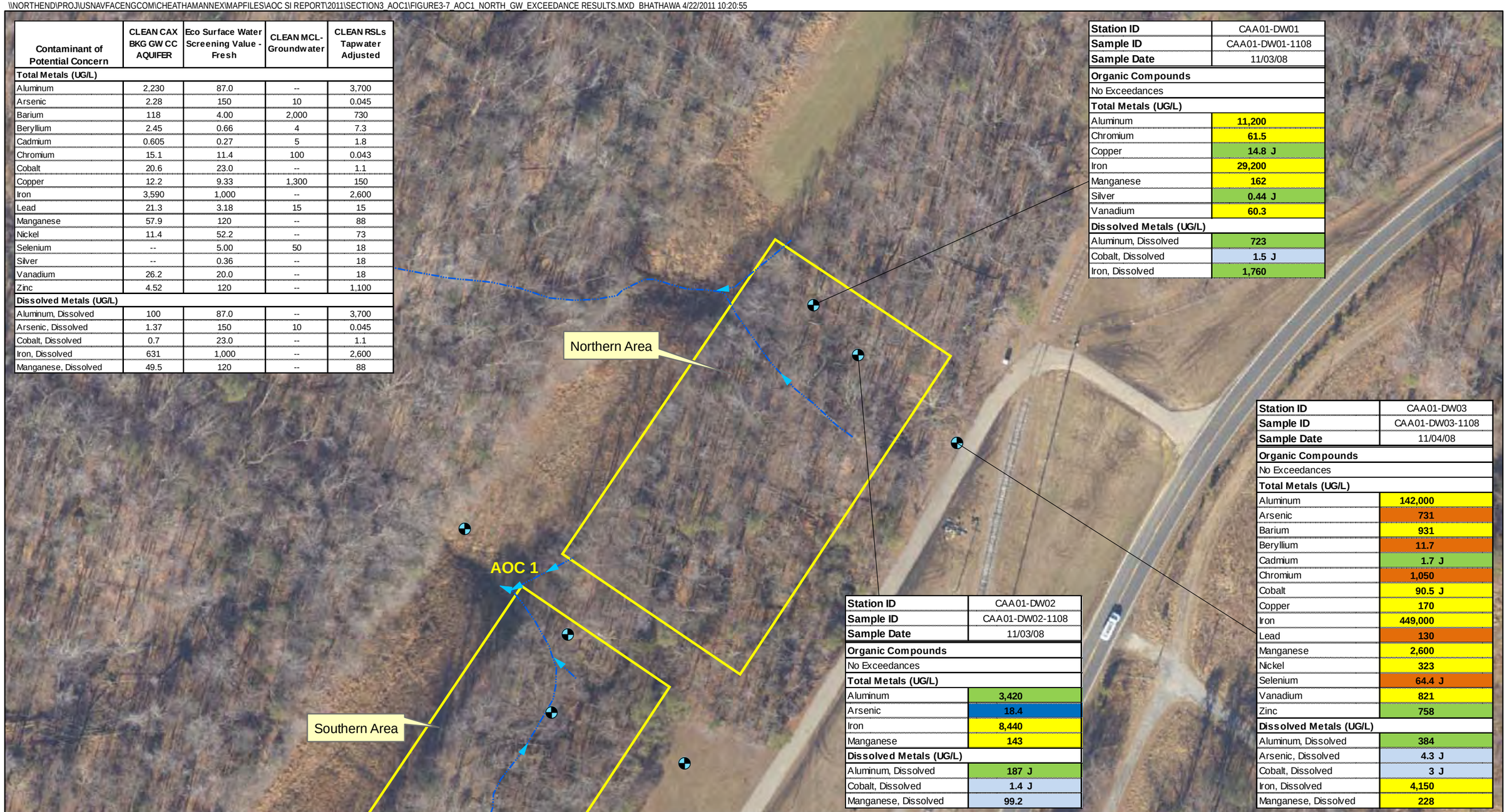
Contaminant of Potential Concern	CLEAN CAX BKG GW CC AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Barium	118	4.00	2,000	730
Beryllium	2.45	0.66	4	7.3
Cadmium	0.605	0.27	5	1.8
Chromium	15.1	11.4	100	0.043
Cobalt	20.6	23.0	--	1.1
Copper	12.2	9.33	1,300	150
Iron	3,590	1,000	--	2,600
Lead	21.3	3.18	15	15
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Selenium	--	5.00	50	18
Silver	--	0.36	--	18
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Arsenic, Dissolved	1.37	150	10	0.045
Cobalt, Dissolved	0.7	23.0	--	1.1
Iron, Dissolved	631	1,000	--	2,600
Manganese, Dissolved	49.5	120	--	88



Station ID	CAA01-DW01
Sample ID	CAA01-DW01-1108
Sample Date	11/03/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	11,200
Chromium	61.5
Copper	14.8 J
Iron	29,200
Manganese	162
Silver	0.44 J
Vanadium	60.3
Dissolved Metals (UG/L)	
Aluminum, Dissolved	723
Cobalt, Dissolved	1.5 J
Iron, Dissolved	1,760

Station ID	CAA01-DW03
Sample ID	CAA01-DW03-1108
Sample Date	11/04/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	142,000
Arsenic	731
Barium	931
Beryllium	11.7
Cadmium	1.7 J
Chromium	1,050
Cobalt	90.5 J
Copper	170
Iron	449,000
Lead	130
Manganese	2,600
Nickel	323
Selenium	64.4 J
Vanadium	821
Zinc	758
Dissolved Metals (UG/L)	
Aluminum, Dissolved	384
Arsenic, Dissolved	4.3 J
Cobalt, Dissolved	3 J
Iron, Dissolved	4,150
Manganese, Dissolved	228

Station ID	CAA01-DW02
Sample ID	CAA01-DW02-1108
Sample Date	11/03/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	3,420
Arsenic	18.4
Iron	8,440
Manganese	143
Dissolved Metals (UG/L)	
Aluminum, Dissolved	187 J
Cobalt, Dissolved	1.4 J
Manganese, Dissolved	99.2

Legend

- Groundwater Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary

Notes:
- Exceeds BKG and ECO
- Exceeds BKG and Tapwater RSL
- Exceeds BKG, Tapwater RSL, and MCL
- Exceeds BKG, ECO and Tapwater RSL
- Exceeds BKG, ECO, Tapwater RSL and MCL

-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

N W E S

0 80 160 Feet

Figure 3-7
AOC 1 North Groundwater Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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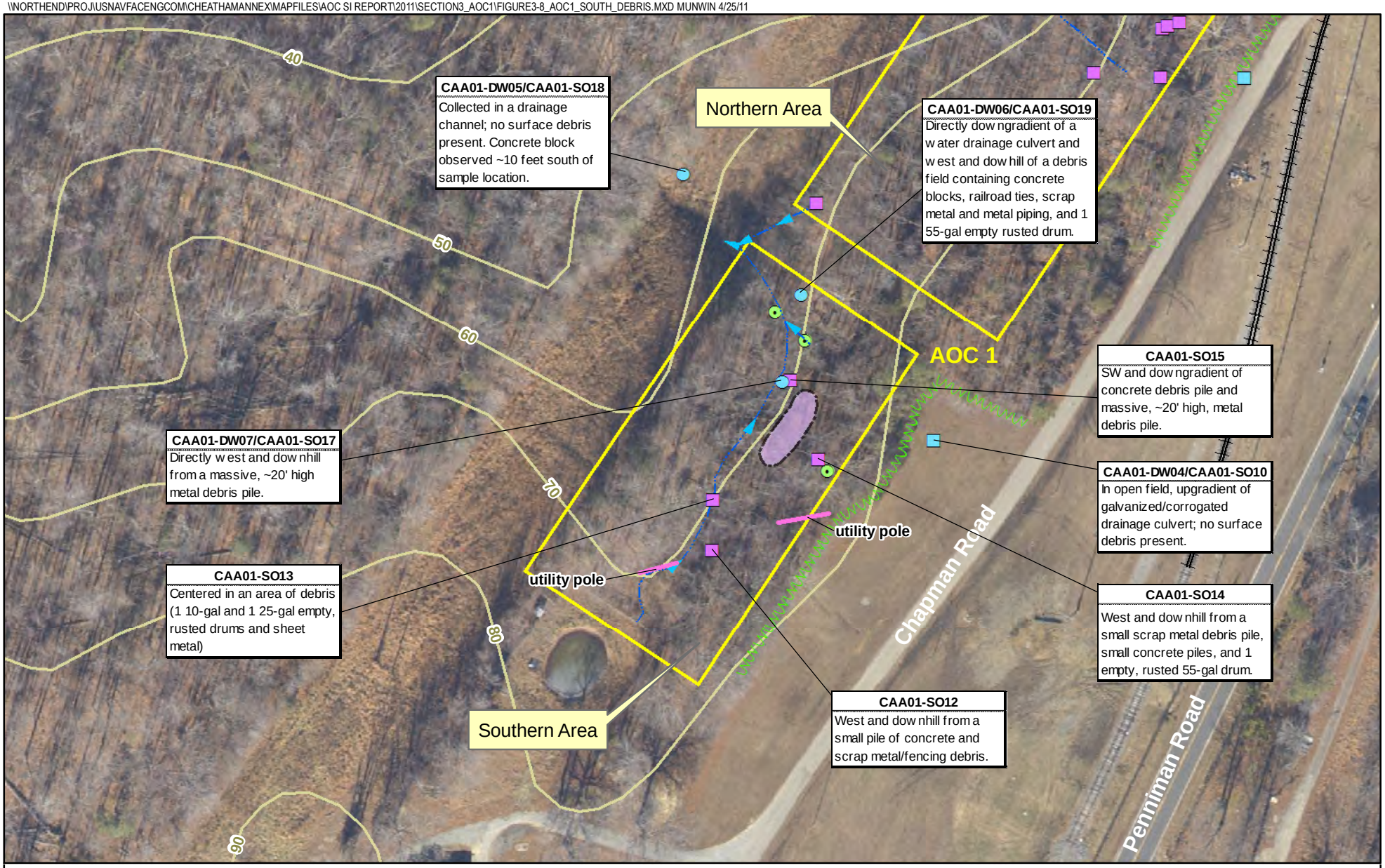
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION3_AOC1\FIGURE3-8_AOC1_SOUTH_DEBRIS.MXD MUNWIN 4/25/11



Legend

- Groundwater/Soil Sample Location
- Soil Sample Location
- Approximate Tripod Groundwater/Soil Sample Location
- Approximate AOC 1 Study Area
- Approximate boundary of massive (~20'H x ~52"W) scrap metal debris pile
- Topographic Surface Contour (feet above mean sea level)
- Railroad tracks
- Tree line
- Drainage Channel (arrow represents flow direction)
- 55-gallon, empty, rusted drum

N W E S

0 50 100 Feet

Figure 3-8
AOC 1 South Debris Near SI Sample Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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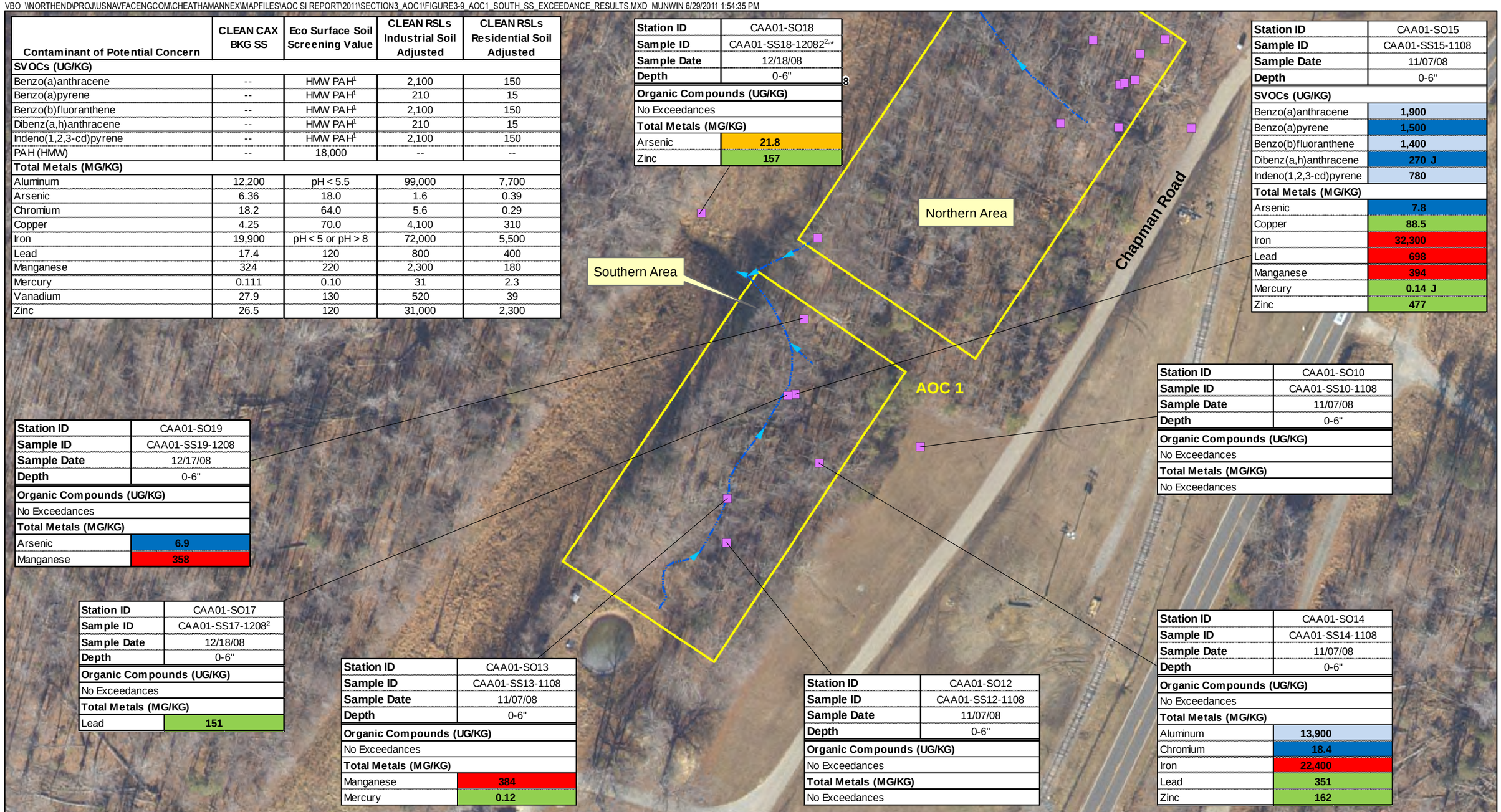
Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
SVOCs (UG/KG)				
Benzo(a)anthracene	--	HMW PAH[1]	2,100	150
Benzo(a)pyrene	--	HMW PAH[1]	210	15
Benzo(b)fluoranthene	--	HMW PAH[1]	2,100	150
Dibenz(a,h)anthracene	--	HMW PAH[1]	210	15
Indeno(1,2,3-cd)pyrene	--	HMW PAH[1]	2,100	150
PAH (HMW)	--	18,000	--	--
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Copper	4.25	70.0	4,100	310
Iron	19,900	pH < 5 or pH > 8	72,000	5,500
Lead	17.4	120	800	400
Manganese	324	220	2,300	180
Mercury	0.111	0.10	31	2.3
Vanadium	27.9	130	520	39
Zinc	26.5	120	31,000	2,300



Station ID	CAA01-SO18
Sample ID	CAA01-SS18-12082[2,*]
Sample Date	12/18/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	21.8
Zinc	157

Station ID	CAA01-SO15
Sample ID	CAA01-SS15-1108
Sample Date	11/07/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	1,900
Benzo(a)pyrene	1,500
Benzo(b)fluoranthene	1,400
Dibenz(a,h)anthracene	270 J
Indeno(1,2,3-cd)pyrene	780
Total Metals (MG/KG)	
Arsenic	7.8
Copper	88.5
Iron	32,300
Lead	698
Manganese	394
Mercury	0.14 J
Zinc	477

Station ID	CAA01-SO19
Sample ID	CAA01-SS19-1208
Sample Date	12/17/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	6.9
Manganese	358

Station ID	CAA01-SO10
Sample ID	CAA01-SS10-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO17
Sample ID	CAA01-SS17-1208[2]
Sample Date	12/18/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Lead	151

Station ID	CAA01-SO13
Sample ID	CAA01-SS13-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Manganese	384
Mercury	0.12

Station ID	CAA01-SO12
Sample ID	CAA01-SS12-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO14
Sample ID	CAA01-SS14-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	13,900
Chromium	18.4
Iron	22,400
Lead	351
Zinc	162

Legend

- Soil Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary

Notes:
- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO & Res RSL
- Exceeds BKG, Res & Ind RSLs
- Exceeds BKG, ECO, Res & Ind RSLs

[1]No value for the individual PAH was used; the constituent was evaluated as part of the total PAH (HMW) evaluation
[2]Sample re-collected on 12/18/08 and analyzed for pesticides/PCBs since these analyses were inadvertently omitted when the sample collected on 11/5/08 was analyzed
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N W E S

0 80 160 Feet

Figure 3-9
AOC 1 South Surface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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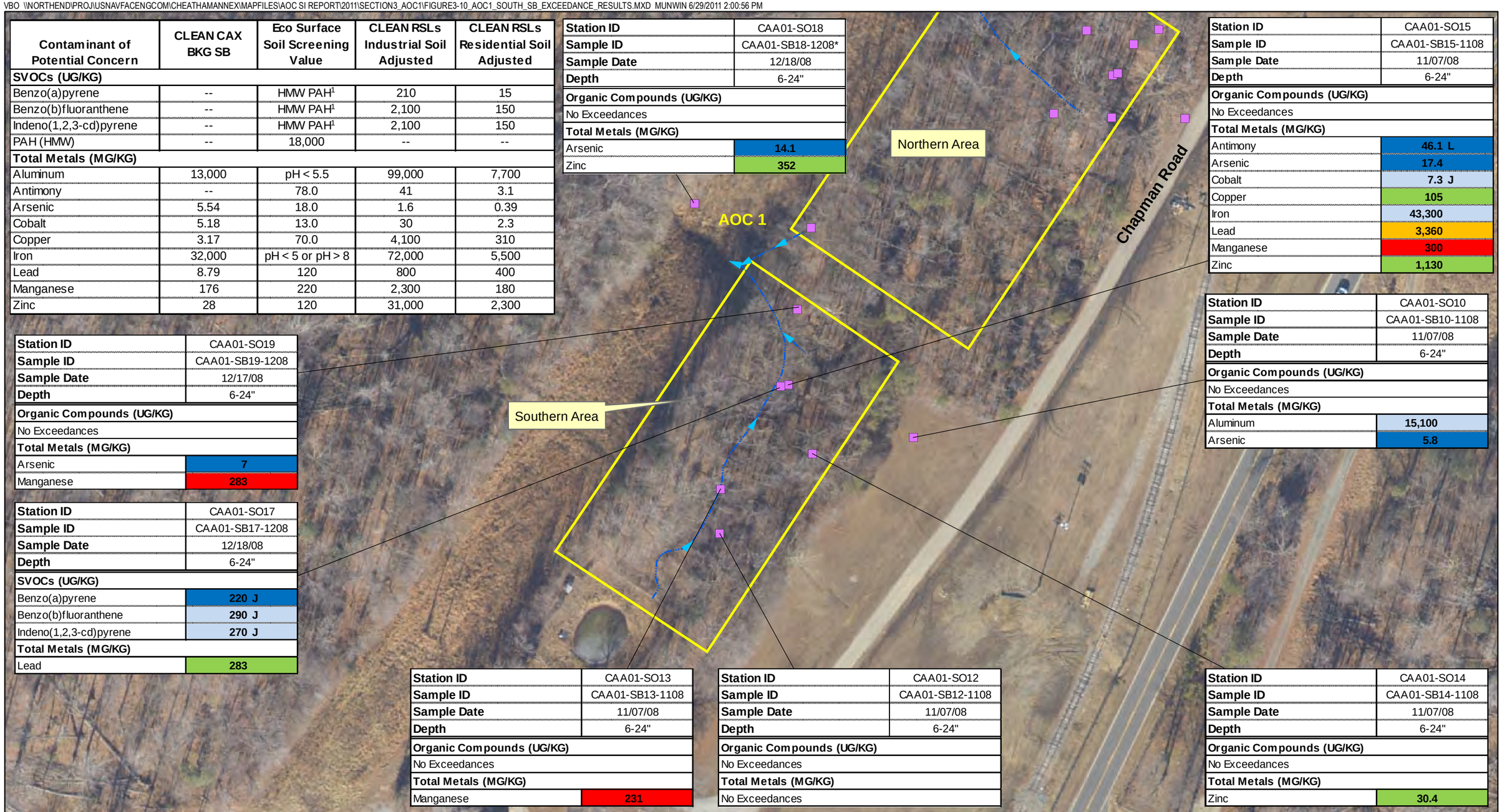
VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION3_AOC1\FIGURE3-10_AOC1_SOUTH_SB_EXCEEDANCE_RESULTS.MXD MUNWIN 6/29/2011 2:00:56 PM



Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
SVOCs (UG/KG)				
Benzo(a)pyrene	--	HMW PAH[1]	210	15
Benzo(b)fluoranthene	--	HMW PAH[1]	2,100	150
Indeno(1,2,3-cd)pyrene	--	HMW PAH[1]	2,100	150
PAH (HMW)	--	18,000	--	--
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Antimony	--	78.0	41	3.1
Arsenic	5.54	18.0	1.6	0.39
Cobalt	5.18	13.0	30	2.3
Copper	3.17	70.0	4,100	310
Iron	32,000	pH < 5 or pH > 8	72,000	5,500
Lead	8.79	120	800	400
Manganese	176	220	2,300	180
Zinc	28	120	31,000	2,300

Station ID	CAA01-SO18
Sample ID	CAA01-SB18-1208*
Sample Date	12/18/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	14.1
Zinc	352

Station ID	CAA01-SO15
Sample ID	CAA01-SB15-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Antimony	46.1 L
Arsenic	17.4
Cobalt	7.3 J
Copper	105
Iron	43,300
Lead	3,360
Manganese	300
Zinc	1,130

Station ID	CAA01-SO19
Sample ID	CAA01-SB19-1208
Sample Date	12/17/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	7
Manganese	283

Station ID	CAA01-SO10
Sample ID	CAA01-SB10-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	15,100
Arsenic	5.8

Station ID	CAA01-SO17
Sample ID	CAA01-SB17-1208
Sample Date	12/18/08
Depth	6-24"
SVOCs (UG/KG)	
Benzo(a)pyrene	220 J
Benzo(b)fluoranthene	290 J
Indeno(1,2,3-cd)pyrene	270 J
Total Metals (MG/KG)	
Lead	283

Station ID	CAA01-SO13
Sample ID	CAA01-SB13-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Manganese	231

Station ID	CAA01-SO12
Sample ID	CAA01-SB12-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO14
Sample ID	CAA01-SB14-1108
Sample Date	11/07/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Zinc	30.4

Legend

- Soil Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary

Notes:
- Exceeds BKG and ECO
- Exceeds BKG and Res RSL
- Exceeds BKG, ECO and Res RSL
- Exceeds BKG, Res and Ind RSLs
- Exceeds BKG, ECO, Res and Ind RSLs

[1]No value for the individual PAH was used; the constituent was evaluated as part of the total PAH (HMW) evaluation
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- - No value available

J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N W E S

0 80 160 Feet

Figure 3-10
AOC 1 South Subsurface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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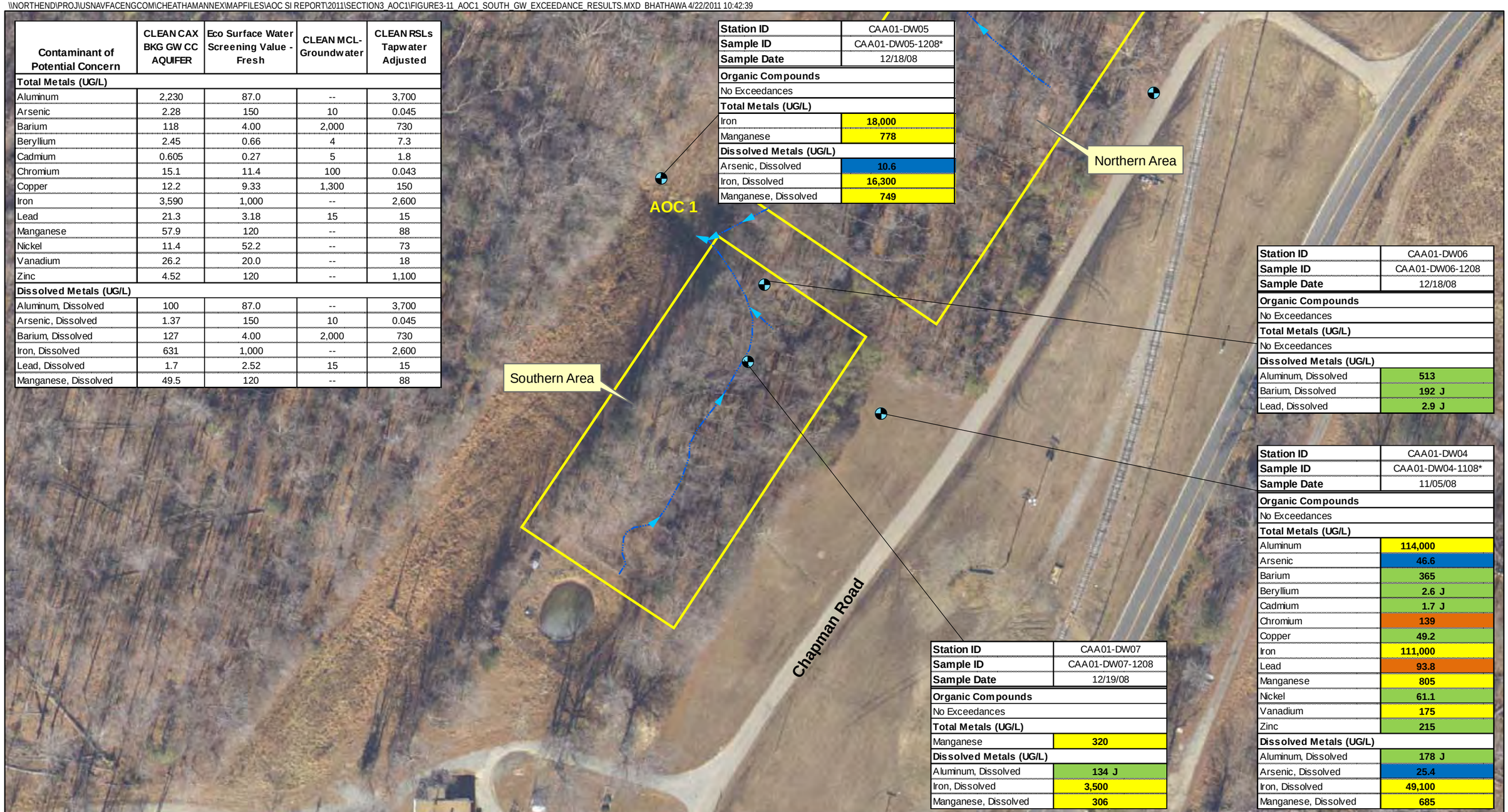
Contaminant of Potential Concern	CLEAN CAX BKG GW CC AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Barium	118	4.00	2,000	730
Beryllium	2.45	0.66	4	7.3
Cadmium	0.605	0.27	5	1.8
Chromium	15.1	11.4	100	0.043
Copper	12.2	9.33	1,300	150
Iron	3,590	1,000	--	2,600
Lead	21.3	3.18	15	15
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Arsenic, Dissolved	1.37	150	10	0.045
Barium, Dissolved	127	4.00	2,000	730
Iron, Dissolved	631	1,000	--	2,600
Lead, Dissolved	1.7	2.52	15	15
Manganese, Dissolved	49.5	120	--	88



Station ID	CAA01-DW05
Sample ID	CAA01-DW05-1208*
Sample Date	12/18/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Iron	18,000
Manganese	778
Dissolved Metals (UG/L)	
Arsenic, Dissolved	10.6
Iron, Dissolved	16,300
Manganese, Dissolved	749

Station ID	CAA01-DW06
Sample ID	CAA01-DW06-1208
Sample Date	12/18/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
Aluminum, Dissolved	513
Barium, Dissolved	192 J
Lead, Dissolved	2.9 J

Station ID	CAA01-DW04
Sample ID	CAA01-DW04-1108*
Sample Date	11/05/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	114,000
Arsenic	46.6
Barium	365
Beryllium	2.6 J
Cadmium	1.7 J
Chromium	139
Copper	49.2
Iron	111,000
Lead	93.8
Manganese	805
Nickel	61.1
Vanadium	175
Zinc	215
Dissolved Metals (UG/L)	
Aluminum, Dissolved	178 J
Arsenic, Dissolved	25.4
Iron, Dissolved	49,100
Manganese, Dissolved	685

Station ID	CAA01-DW07
Sample ID	CAA01-DW07-1208
Sample Date	12/19/08
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Manganese	320
Dissolved Metals (UG/L)	
Aluminum, Dissolved	134 J
Iron, Dissolved	3,500
Manganese, Dissolved	306

Legend

- Groundwater Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary

Notes:
- Exceeds BKG and ECO
- Exceeds BKG, Tapwater RSL, and MCL
- Exceeds BKG, ECO and Tapwater RSL
- Exceeds BKG, ECO, Tapwater RSL and MCL

* Indicates duplicate sample was collected at this location.
Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

N W E S

0 80 160 Feet

Figure 3-11
AOC 1 South Groundwater Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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SECTION 4

AOC 2—Dextrose Dump

This section presents an evaluation of the results from the SI performed at AOC 2. The section includes a summary of the investigations conducted at the site, the CSM, and the release assessment decision analysis.

4.1 History of Investigation

The following actions and investigations were previously conducted and documented at AOC 2:

- A routine housekeeping effort in 1998 involving removal of glass bottles from the ground surface of AOC 2 (RMI, 1998)
- Final Field Investigation Report, Site 1 and AOC 2, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Annex Site (Baker, 1999)
- Final Field Investigation Report, Site 7 and AOC 2, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia (Baker, 2001b)
- Final Trenching Letter Report, Site 1, Site 4, and AOC 2, Naval Weapons Station Yorktown, Cheatham Annex Site, Williamsburg, Virginia (Baker, 2002)

4.2 Conceptual Site Model

The CSM for AOC 2 is based on the data collected as part of the previous investigations and the SI. The CSM interprets the physical characteristics, the distribution of contamination and potential contaminant source, potential migration pathways, and the potential exposure and receptor pathways. The CSM for AOC 2 is shown in **Figure 4-1**.

4.2.1 Site History and Potential Sources of Release

AOC 2 is a small (less than 1 acre) wooded site located to the north of Garrison Road, along the southern perimeter of CAX as depicted in **Figure 4-2**. AOC 2 was identified during site visits by the Navy, USEPA, VDEQ, and Baker in late 1997 and early 1998 and consists of several rows of concrete foundation piers that at one time supported a Shipping House associated with the PSLP. The majority of structures associated with the Penniman facility were demolished between 1918 and 1925. Grass-covered lanes leading to the site area are likely locations of former rail lines that have been removed. Several partially buried glass bottles (many of which are labeled “dextrose”) and unlabeled drums were discovered in the area. Several mounds present in the area were suspected to contain buried debris (Baker, 2001b).

1998 Routine Housekeeping Operation

In May 1998, a routine housekeeping operation was performed at the site. Reactives Management, Inc. removed a total of 470 bottles from the ground surface. Approximately five percent of the bottles (24 bottles) were selected randomly and analyzed[5]. Results indicated that each bottle had greater than 2,000 parts per million (ppm) of glucose, which is indicative of dextrose. The bottle contents were emptied into the Hampton Roads Sanitation District sanitary sewer system, and the bottles were sent to a glass recycler (RMI, 1998). Only bottles on the surface were removed.

1998 Field Investigation

To gain a better understanding of the nature and extent of possible contamination at AOC 2, a field investigation was conducted during October 1998. This investigation included a geophysical survey to estimate the extent of buried material, as well as soil and groundwater sampling via DPT. Soil and groundwater samples were analyzed for VOCs, SVOCs, pesticides, PCBs, nitramines/nitroaromatics (explosives), and inorganics. Groundwater samples

[5] The report did not specify the exact analysis requested.

were collected from the Cornwallis Cave aquifer (the shallowest aquifer underlying the site) from temporary monitoring wells installed within each soil boring. The 1998 AOC 2 sample locations are depicted in **Figure 4-3** and the analytical data from this report are included in **Tables G-5** through **G-11** in **Appendix G**.

During the field investigation, twelve 55-gallon drums were observed at the ground surface, partially buried and empty. Based on the results of the geophysical survey, areas of significant anomalies were delineated that could potentially coincide with buried debris (Baker, 1999).

Analytical results indicated that no SVOCs, PCBs, or explosives were detected in surface or subsurface soil. Pesticides (heptachlor epoxide, dichlorodiphenyldichloroethene [DDE], and dichlorodiphenyltrichloroethane [DDT]) were detected in soil at relatively low concentrations, considered anthropogenic, and were attributed to routine pesticide application. One VOC (acetone), detected in one subsurface soil sample, was considered a laboratory artifact. The inorganic concentrations detected in soil were generally within the range of background concentrations for WPNSTA Yorktown and consistent with soils of the Virginia Coastal Plain; however, the concentrations of several inorganics exceeded ecological screening criteria and iron indicated a potential (non-carcinogenic) risk to human health.

Based on the groundwater analytical results, no VOCs, pesticides, PCBs, or explosives were detected in groundwater. One SVOC, diethyl phthalate, was detected and considered a laboratory artifact. Concentrations of inorganics were generally within the range of background concentrations for WPNSTA Yorktown groundwater.

It was recommended in the Field Investigation Report that the sources of the geophysical anomalies and potential sources of contamination be identified by excavating six shallow test pits in the vicinity of the most significant anomalies detected (Baker, 1999).

1999 Field Investigation/2000 Supplemental Test Pit Investigation

In November 1999, six test pits (A2TP01 through A2TP06) were excavated and sampled at AOC 2 to determine the source of geophysical anomalies observed during the October 1998 field investigation. Buried materials were encountered in each test pit and included empty drums, dextrose bottles, and unopened respirator cartridge canisters. One soil sample was collected from within the debris zone at each test pit (samples A2TP01F through A2TP06F) and one native soil sample was collected underlying the debris at each test pit (samples A2TP01N through A2TP06N); all soil samples were analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, and inorganics. The analytical data from this report are included in **Tables G-12** through **G-14** in **Appendix G**. The 1999 sample locations are depicted in **Figure 4-3**.

During this field investigation, 43 drums (all empty), including unearthed drums and drums collected from the ground surface, as well as 280 dextrose bottles (whose contents were emptied into drums on site) were removed for off-site disposal. One respiratory cartridge canister was submitted for analysis of full TCLP parameters and Resource Conservation and Recovery Act (RCRA) characterization. Because cadmium and lead concentrations exceeded TCLP levels, the Navy, in consultation with the USEPA and VDEQ, agreed to expand the test pit program to define the extent of buried debris and canisters.

In 2000, a supplemental test pit investigation was conducted and a total of 47 exploratory test pits were advanced at AOC 2. Materials encountered included respirator cartridge canisters, empty drums, dextrose bottles, and military clothing. The lateral extent of the buried debris was not completely defined. During this supplemental test pit investigation, four confirmatory soil samples (A2-CS01 through A2-CS04) were collected and analyzed for VOCs, SVOCs, pesticides, PCBs, and inorganics. Sample A2-CS01 was a five-point composite collected from a soil stockpile; samples A2-CS02 and A2-CS 03 were collected from native soil at the bottom of the respirator cartridge removal excavation; and sample A2-CS04 was a composite collected from exploratory test pit X-45; the locations of the exploratory test pits are shown in **Figure 4-4**.

Confirmatory sample analytical results indicated little, if any, impact to soil or groundwater at AOC 2[6]. The highest degree of contamination was observed in sample A2-CS04, which contained asphalt. Based on the results of the supplemental test pit investigation, additional buried dextrose bottles, empty drums (some coated with tar), respiratory cartridge canisters, and unused military uniforms (quantities not documented) were observed at AOC 2. A limited geophysical investigation was recommended to delineate the lateral extent of buried respirator cartridge canisters and the location of the eastern perimeter of disposal along Deer Pit Road, and a test pit investigation was recommended to confirm the results of the geophysical investigation (Baker, 2001b).

2001 Trenching Activities

In 2001, 15 trenches (AOC2TT01 through AOC2TT15) were excavated to confirm the presence or absence of buried respiratory cartridges along Deer Pit Road and to obtain additional information concerning subsurface materials potentially buried at AOC 2 (**Figure 4-4**). In six of these trenches (AOC2TT05 through AOC2TT10), dextrose bottles, some clothing, and metal debris were observed and empty 55-gallon drums were observed in trenches AOC2TT13 and AOC2TT14. The remaining seven trenches contained native soil. No samples were collected for analyses.

During the 2001 trenching activities, the horizontal and vertical extent of the dextrose dump along Deer Pit Road was delineated and debris was observed to be confined primarily to beneath the road, with some surface debris outside the road area. The majority of debris observed consisted of bottled dextrose water. Along the extent of Deer Pit Road, the debris uncovered included dextrose bottles in wooden crates and clothing. No respirator cartridge canisters were found along or around Deer Pit Road during the trenching activities. An area of 55-gallon drums was verified from the previous investigations.

4.2.2 Physical Setting

Topography and Surface Water

The topography of AOC 2 is predominantly flat. No wetlands or other surface water bodies are located at AOC 2, and there are no nearby water bodies downgradient of the site. Surface runoff at the site is anticipated to pond and infiltrate into the subsurface.

Hydrogeology

In general, native soils are predominantly clay and silt at AOC 2. As observed during trenching activities in 2001, a fill layer of sand was found to be present over buried materials in some areas of AOC 2 (Baker, 2002). Soil boring and test pit logs from previous investigations at AOC 2 are included in the Site 1 and AOC 2 Final Field Investigation Report (Baker, 1999); the Site 7 and AOC 2 Final Field Investigation Report (Baker, 2001b); and the Site 1, Site 4, and AOC 2 Final Trenching Letter Report (Baker, 2002).

The shallow aquifer underlying AOC 2 is the Cornwallis Cave Aquifer. Groundwater depths during the 1998 Field Investigation ranged from 22 to 33 feet bgs. Based on groundwater elevation data collected in 1998, groundwater flow is to the southeast, toward King Creek (Baker, 1999).

Current and Future Land Use

AOC 2 is located in a wooded area with no specified designated use. AOC 2 is not surrounded by a gate or fencing, but it is within the confines of CAX and access is restricted to the general public. Navy and DoD personnel do have access to the area, and there are nearby tree stands used for hunting. Future land use at AOC 2 is not expected to change and will likely continue as wooded/green space for the foreseeable future.

[6] CH2M HILL compared the analytical data provided in the Field Investigation Report (Baker, 2001b) against the laboratory Form 1s (raw and analytical data) and noted the following discrepancies: (1) the concentration of aluminum for Sample CAA02-A2-CS02-0200 is 14,700 mg/kg (not 147,000 mg/kg, as documented in the Field Investigation Report), and (2) the concentration of beryllium for Sample CAA02-A2-CS02-0200 is 0.91 mg/kg (not 0.1 mg/kg, as documented in the Field Investigation Report). These concentrations were corrected in the electronic database. These results WERE NOT included in the SI risk screen, as their exact location is unknown.

4.2.3 Distribution of Contamination

Data collected during the 1998 and 1999 Field Investigations were evaluated as part of this SI report (**Figure 4-3**). **Tables 4-1** through **4-3** summarize the constituents detected in AOC 2 historical surface soil, subsurface soil, and groundwater samples. The tables also identify screening criteria exceedances. All analytical data for the SI samples are provided in **Appendix H**.

During the SI Work Plan preparation, it was determined that no additional sampling was necessary at AOC 2, based on the available historical data discussed in **Section 4.2.1**. Previous investigations identified the horizontal and vertical extent of disposed material. For those areas of AOC 2 where debris has been identified and sampling was not conducted (Area 1b and Area 3) (**Figure 4-5**), the debris is inert (for example, dextrose bottles, deer carcasses, military uniforms) and not considered a CERCLA source.

For Area 2, which contains the respirator cartridge canisters and 55-gallon drums (**Figure 4-5**), existing analytical data are adequate to support a qualitative risk screening approach and background comparison to determine whether a release has occurred that may pose an unacceptable risk at AOC 2 because: (1) samples were collected from within the debris zone and native soil underlying debris – areas that represent the highest potential for contamination and (2) the spatial distribution of samples is sufficient.

Buried Debris

Based on the aforementioned trenching activities, AOC 2 was separated into three areas based on the types of debris observed during the trenching activities. Areas 1a and 1b contain dextrose bottles and minor debris, and Area 3 contains military clothing (**Figure 4-5**). Area 2 contains respirator cartridge canisters and 55-gallon drums. Calculations of the debris volumes generated for each of these areas were computed for anticipated future disposal. As documented in the Final Trenching Letter Report (Baker, 2002), the three areas are shown in **Figure 4-5** and the estimated waste volumes are as follows:

Areas 1a, 1b, and 3 (inert debris)	=	890 yd^3
Area 2 (unopened respirator cartridges and empty 55-gallon drums)	=	445 yd^3
and (one foot soil removal underneath cartridges and drums)	=	155 yd^3
Total volume of Areas 1a, 1b, 2, and 3	=	1,490 yd^3

Soil

A detailed listing of the historical surface and subsurface soil samples evaluated during the SI is provided in **Table 2-1**. A total of 6 surface and 21 subsurface soil samples were collected during the 1998 and 1999 Field Investigations. Of the 21 subsurface soil samples, 6 were collected from the debris fill zone of test pits (subsurface soil sample IDs designated with an "-F"), and 6 were collected from native soil beneath the debris fill zone of test pits (subsurface soil sample IDs designated with an "-N"). Surface and subsurface soil samples collected in 1998 were analyzed for VOCs, SVOCs, pesticides and PCBs, explosives, and inorganics and cyanide; surface and subsurface soil samples collected in 1999 were analyzed for VOCs, SVOCs, pesticides and PCBs, and inorganics and cyanide. The soil analytical results are listed in **Tables 4-1 and 4-2**, and the exceedances are shown on **Figures 4-6 and 4-7**.

VOCs, SVOCs, Pesticides, PCBs, and Explosives

No VOCs, SVOCs, or explosives were detected at concentrations above their respective screening criterion in surface or subsurface soil samples (**Tables 4-1** and **4-2**).

Two pesticides in surface soil (4,4'-DDE and 4,4'DDT) and one pesticide in subsurface soil exceeded at least one screening criterion (**Figure 4-6** and **4-7,** respectively). These three exceedances occurred at one sample location (A2HA02), which was located within Area 2. The concentrations of 4,4'-DDE (520J µg/kg) and 4,4'DDT (640J µg/kg) in surface soil, and 4,4'-DDE (120J µg/kg) in subsurface soil exceeded the ecological screening values [4,4'-DDE

(114 µg/kg) and 4,4'DDT (100 µg/kg) – same value for both surface and subsurface]. Pesticides were not known to be disposed of at AOC 2 and may be attributable to normal pesticide use applied to soil at DoD facilities to control pests and weeds.

One PCB (Aroclor-1260) was detected in only one subsurface soil sample (310 µg/kg in the duplicate A2-TP01F at Test Pit TP01), slightly above the residential RSL (220 µg/kg) (**Figure 4-7**). However, the primary sample from this location was below screening criteria. Both of these subsurface soil samples, A2-TP01F and its duplicate, were collected within the debris zone at approximately 3.5 feet bgs. However, Aroclor-1260 was not detected in the native soil sample (A2-TP01N) collected from the bottom of Test Pit TP01 at 5 feet bgs. Therefore, Aroclor-1260 is likely a localized occurrence and not migrating from the debris material. PCBs tend to bind to soil and are not readily mobile.

Inorganic Constituents

Six inorganics (arsenic, chromium, iron, mercury, selenium, and vanadium) exceeded at least one screening criterion in surface soil (**Figure 4-6**).

- The most detected inorganic constituents above background concentrations and screening criteria were arsenic, chromium, and mercury with maximum concentrations of 20, 39, and 1.8 mg/kg, respectively (above their respective base background UTLs of 6.36, 18.2, and 0.111 mg/kg).

Twelve inorganics (aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, lead, mercury, selenium, thallium, and vanadium) exceeded background concentrations and at least one screening criterion in subsurface soil (**Figure 4-7**).

- The most detected inorganic constituents above background concentrations and screening criteria were arsenic, cobalt, iron, and mercury with maximum concentrations of 36.5, 10.2J, 45,300, and 1.0 mg/kg, respectively (above their respective base background UTLs of 5.54, 5.18, 32,000, and 0.14 mg/kg).
- Cobalt and iron were slightly higher than the background concentrations and are likely related to natural background conditions. Mercury concentrations are generally consistent across the site, ranging from 056 J to 1.2 mg/kg. However, the type of debris at AOC 2 does not appear to be a likely source of mercury.

Groundwater

Groundwater samples were collected from four temporary monitoring wells during the 1998 Field Investigation and analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, and inorganics (total and dissolved), and cyanide. Each of these samples was co-located with surface and subsurface soil samples. A listing of the historical groundwater samples evaluated during the SI is provided in **Table 2-1**.

VOCs, SVOCs, Pesticides, PCBs, and Explosives

- No VOCs, SVOCs, pesticides, PCBs, or explosives were detected at concentrations above their respective screening criterion in the groundwater samples (**Table 4-3**).

Inorganic Constituents

Twelve total inorganics (aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, thallium, and vanadium) and two dissolved inorganics (arsenic and manganese) exceeded at least one screening criterion and background concentrations in groundwater (**Figure 4-8**).

Dissolved inorganic data are likely more representative of inorganic concentrations migrating in groundwater since the DPT method generally results in higher total inorganic concentrations as a result of higher turbidity during sampling. Maximum concentrations of dissolved arsenic and manganese detected in groundwater were 5.5J and 317 µg/L, respectively. Arsenic is commonly adsorbed to or co-precipitated with iron and manganese oxides, adsorbed to clay mineral surfaces, and associated with sulfide minerals. Natural dissolving or desorbing of arsenic from these source materials releases arsenic to groundwater.

4.2.4 Potential Exposure and Receptor Pathways

Potential receptors at AOC 2 are: current/future recreational users/visitors, trespassers, maintenance workers, and industrial workers, future adult/child residents and construction workers, and lower trophic level terrestrial receptors (plants and soil invertebrates).

Human Health Risk Evaluation

The HHRS for AOC 2 is presented in **Appendix A**. The supporting tables for the evaluation are presented in **Appendix A**, **Attachment A.2**. An overview of the various potential receptors and exposure pathways at the site is presented in **Figure A-1** of **Appendix A**. The results of the evaluation for AOC 2 are summarized as follows.

Surface Soil

The risk-based screening for surface soil at AOC 2 is provided in **Appendix A**, **Attachment A.2**, **Tables 2.1** through **2.1b**.

- In Step 1, four constituents were detected in surface soil samples above background concentrations (for metals) and the human health screening levels, and were selected as COPCs – arsenic, chromium, iron, and vanadium.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.1 to 1; one of the two HI values was greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a target organ HI greater than 0.5 were identified as COPCs and include arsenic, chromium, and iron.
- In Step 3, based on the use of the 95 percent UCL for the EPCs, a cumulative cancer risk of 1×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. The cumulative target organ HI was 0.6; this HI value was greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or cumulative target organ HI were identified as COPCs and include arsenic, chromium, and iron.

Exposure to surface soil at AOC 2 may result in unacceptable human health risks associated with arsenic, chromium, and iron. The potential unacceptable carcinogenic risk is primarily associated with chromium, the only COPC that alone contributes a risk above the screening benchmark level. It was assumed that all of the chromium detected in the soil is in the hexavalent form, which is highly unlikely. Therefore, it is likely there would be no unacceptable carcinogenic risk associated with exposure to the surface soil. The potential unacceptable noncarcinogenic hazard is primarily associated with iron, which is a required human nutrient. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA02-A2-DPB03-00-1098. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 4.4 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 8.8 mg/day iron (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children. Therefore, it is unlikely there would be any adverse effects associated with exposure to iron in the surface soil at the site.

Subsurface Soil

The risk-based screening for subsurface soil at AOC 2 is provided in **Appendix A**, **Attachment A.2**, **Tables 2.2** through **2.2b**.

- In Step 1, nine constituents were detected in subsurface soil samples above background concentrations and the human health screening levels, and were identified as COPCs—Aroclor-1260, aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, and vanadium.

- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 4×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs of 0.2 to 0.9 were calculated for the COPCs; one HI value is greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were identified as COPCs and include Aroclor-1260, arsenic, chromium, copper, and iron.
- In Step 3, based on the 95 percent UCL for the EPCs, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. The cumulative HI for gastrointestinal effects was 0.6; this value is greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk greater than 5×10^{-5} or the cumulative target organ (gastrointestinal) HI greater than 0.5 were selected as COPCs and include Aroclor-1260, arsenic, chromium, copper, and iron.

Exposure to subsurface soil at AOC 2 may result in unacceptable human health risks associated with Aroclor-1260, arsenic, chromium, copper, and iron. The potential unacceptable carcinogenic risk is primarily associated with chromium, the only COPC that alone contributes a risk above the screening benchmark level. It was assumed that all of the chromium detected in the soil is in the hexavalent form, which is highly unlikely. If chromium is not considered a COPC, then the cumulative cancer risk would be below 5×10^{-5} and Aroclor-1260 and arsenic would not be identified as COPCs. Therefore, it is likely there would be no unacceptable carcinogenic risk associated with exposure to the subsurface soil. The potential unacceptable noncarcinogenic hazard is primarily associated with iron, which is a required human nutrient. Although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA02-A2-DPB04-09-1098. Ingestion of soil at the maximum detected concentration of iron [45,300 mg/kg, which would result in ingestion of 4.5 mg/day iron for an adult (45,300 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 9.1 mg/day iron (45,300 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children. Therefore, it is unlikely there would be any adverse effects associated with exposure to iron in the subsurface soil at the site, and the HI associated with copper alone is below the risk-ratio screening benchmark of 0.5.

There were no residential or industrial soil RSL values for thallium when the AOC 2 HH screen was originally prepared, and thallium was not detected in the background data set. However, with the June 2011 RSL table update, which became available while the draft document was undergoing regulator review, RSLs have been established for thallium, so a comparison to these values was made[7]. Thallium was detected in one of the 23 subsurface soil samples at a concentration of 0.84 mg/kg, qualified with an L data validation qualifier (L indicates that the concentration may be biased low). This concentration exceeds the adjusted residential soil RSL of 0.078 mg/kg, and barely exceeds the unadjusted residential soil RSL (0.78 mg/kg). This concentration does not exceed the adjusted industrial soil RSL of 1 mg/kg (or the unadjusted industrial soil RSL of 10 mg/kg).

Groundwater

The risk-based screening for groundwater at AOC 2 is provided in **Appendix A**, **Attachment A.2**, **Tables 2.3** and **2.3a**.

- In Step 1, eleven constituents were detected in groundwater samples above background concentrations and the human health screening levels, and were identified as COPCs—aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, and vanadium. The maximum lead concentration in

[7] The AOC 2 soil risk screen was not re-run with the June 2011 RSLs; only a comparison of results against the new thallium RSLs was conducted.

groundwater is 95 µg/L, which is greater than the lead screening level. The average lead concentration, 46 µg/L, is also greater than the lead screening level. Therefore, lead is considered to be present at a concentration of potential concern and lead was retained as a COPC.

- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-2} associated with arsenic and chromium was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.2 to 15; most of the HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or the cumulative HI were identified as COPCs and include: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, manganese, and vanadium.
- Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at AOC 2 may result in unacceptable human health risks. The risk is associated with aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, and vanadium detected in groundwater.

There was no tap water RSL value for thallium when the AOC 2 HH screen was originally prepared, and thallium was not detected in the background data set. However, with the June 2011 RSL table update, which became available while the draft document was undergoing regulator review, RSLs have been established for thallium, so a comparison to these values was made[8]. Total thallium was detected in two of the four groundwater samples at concentrations of 1.2 L µg/L and 2 J µg/L /kg (the L qualifier indicates that the concentration may be biased low, while the J qualifier indicates the concentration is estimated). These concentrations exceed the adjusted tap water RSL of 0.037 µg/L, and the unadjusted tap water RSL (0.37 µg/L); however, they are within the range of the MCL (2 µg/L). Thallium was not detected in the dissolved phase for any of the groundwater samples.

Ecological Risk Evaluation

The results of the ecological risk evaluation for surface soil and subsurface soil at AOC 2 are presented in **Tables B-16** through **B-19** of **Appendix B**. Since no water bodies are nearby or downgradient of the site, potential groundwater transport and subsequent discharge was not included as part of the ecological risk evaluation.

Surface Soil

Four inorganics (arsenic, manganese, mercury, and selenium) and two organics (4,4'-DDE and 4,4'-DDT) exceeded screening values based upon maximum detected concentrations. All but manganese also exceeded background UTLs, where available (**Appendix B, Tables B-16** and **B-17**). The screening values for aluminum and iron were pH-based but soil pH data were not available. Aluminum did not exceed background UTLs but iron did. Thus, arsenic, iron, mercury, selenium, 4,4'-DDE, and 4,4'-DDT were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for 4,4'-DDE, arsenic, and selenium were less than one. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded one for 4,4'-DDT (1.08) and mercury (11.2); these two constituents were identified as refined COPCs. Iron was also identified as a refined COPC because it exceeded the background concentration and soil pH data were not available.

Subsurface Soil

Three inorganics (arsenic, mercury, and selenium) and one organic (4,4'-DDE) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (**Appendix B, Tables B-18** and **B-19**) in the samples screened for ecological risk (i.e., less than or equal to the 2-foot depth). Thus, these four constituents were identified as initial COPCs. The screening values for aluminum and iron were

[8] The AOC 2 groundwater risk screen was not re-run with the June 2011 RSLs; only a comparison of results against the new thallium RSLs was conducted.

pH-based but soil pH data were not available. Aluminum did not exceed background UTLs, but iron did. Thus, iron was also identified as an initial COPC.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for 4,4'-DDE, arsenic, and selenium were less than 1.0. Thus, these three constituents were not identified as refined COPCs.
- Iron was not identified as a refined COPC based on the low magnitude of its background value exceedance (ratio of 1.31).

The mean HQ exceeded one for mercury (6.50); this constituent was identified as a refined COPC.

Groundwater

As discussed in **Appendix B,** groundwater screening was not conducted at AOC 2.

4.3 AOC 2 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Analysis and is summarized in **Table 4-4**.

4.3.1 Step 1—Determination of Potential CERCLA Eligibility and, if CERCLA-Eligible, has a CERCLA-Related Release Occurred at the Site?

Historical information indicates the site is an unlined, non-permitted disposal area with unknown date(s) of debris disposal. Debris identified at AOC 2 includes respirator cartridge canisters, empty drums, dextrose bottles, and military clothing. Because AOC 2 was listed as an SSA within the FFA as a site that "may pose a threat, or potential threat, to human health and the environment" (Navy, 2005), and because pesticides, PCBs, and inorganic constituents were detected during the SI, it is considered to be CERCLA-eligible. AOC 2 is further evaluated in the decision analysis process in Step 2a.

4.3.2 Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a – Comparison of Data Against Conservative Risk-Based Screening Values

Specifically, the data for the CERCLA-related constituents identified at AOC 2 were compared to the screening criteria described in **Section 1** and identified on the detection tables, **Tables 4-1 through 4-3**. Those constituents that exceed one or more criteria (and background, if available, for inorganics) are shown in **Figures 4-6 through 4-8**.

In summary, two pesticides (4,4'-DDE, 4,4'-DDT) and seven inorganics (arsenic, chromium, iron, manganese, mercury, selenium, and vanadium) exceeded one or more screening criterion in surface soil. One pesticide (4,4'-DDE), one PCB (Aroclor-1260), and eleven inorganics (aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, mercury, selenium, thallium, and vanadium) exceeded screening criteria in subsurface soil.

In groundwater, twelve total inorganics (aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, thallium, and vanadium) and two dissolved inorganics (arsenic and manganese) exceeded at least one screening criterion.

Step 2b – Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

Human Health Risk Evaluation

Exposure to surface soil at AOC 2 would not be expected to result in any unacceptable human health risks, based on the assumption that chromium is likely present in the trivalent, not the hexavalent, form. In the trivalent form, neither chromium nor arsenic would be considered COPCs. Also, iron is a required human nutrient and any associated adverse effects from exposure are unlikely. With the exception of one subsurface soil detection of thallium, exposure to subsurface soil at AOC 2 would not be expected to result in any unacceptable human health risks based on the assumption that chromium is likely present in the trivalent, not the hexavalent form. In the

trivalent form, chromium, Aroclor-1260, and arsenic would not be considered COPCs. Also, iron is a required human nutrient and any associated adverse effects from exposure are unlikely. Additionally, the HI associated with copper alone is below the risk-ratio screening benchmark of 0.5.

Exposure to groundwater at AOC 2 may result in unacceptable human health risks. The risk is associated with aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, thallium, and vanadium detected in groundwater. However, only arsenic and manganese exceeded human health screening criteria in the dissolved phase. All other inorganic constituents are likely attributable to background from suspended solids of the aquifer. Also, aluminum, beryllium, iron, and lead did not exceed screening criteria in site soil.

Ecological Risk Evaluation

At AOC 2, potential unacceptable risks were identified for exposure to surface soil attributable to 4,4'-DDT, mercury, and iron and to subsurface soil attributable to mercury. However, 4,4'-DDT is likely attributable to normal pesticide application, and iron is likely associated with background. The type of debris at AOC 2 does not appear to be a likely a mercury source.

4.3.3 Step 3—Is Further Investigation or Action Required?

The horizontal extent of the debris was sufficiently characterized during the previous field investigations and trenching activities.

Exposure to surface soil at AOC 2 may result in unacceptable human health risks associated with arsenic and chromium. There are potential ecological risks in surface soil associated with 4,4'-DDT, mercury, and iron; however, 4,4'-DDT may be attributable to normal pesticide application and iron is likely associated with background.

Exposure to subsurface soil at AOC 2 may result in unacceptable human health risks associated with Aroclor-1260, arsenic, chromium, copper, and thallium. There is potential ecological risk in subsurface soil associated with mercury.

Results from the groundwater sampling indicate potential human health risks associated with exposure to aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, thallium, and vanadium. Of these 11 total inorganics, only arsenic and manganese were detected in the dissolved phase. Therefore, NFA is recommended. A consensus letter will be prepared for CAX Partnering Team review to capture the NFA recommendation, including a risk assessment using existing data.

An interim removal action is recommended to remove the Area 2 debris (respirator cartridges and empty 55-gallon drums) and post removal soil samples should be collected. The removal would also address the potential ecological risk associated with 4,4'-DDT in surface soil and the human health COPCs in surface and subsurface soil, except arsenic and chromium, which had exceedances outside of Area 2. Although the subsurface soil DDE detection was NOT retained as a refined ecological COPC, DDT was retained as an ecological COPC for surface soil at this same location. The Area 2 removal excavation will be at least a foot deep (and greater depending on the location of the respirator cartridges and drums), so the subsurface DDE location will be removed as well. Post removal soil samples should be collected; the number, location, and analyte list for these samples will be determined during the development of the EE/CA for the removal action.

Regarding the potentially unacceptable human health risk to arsenic and chromium in the surface and subsurface soil, this risk is based on the assumption that chromium is present in the hexavalent form, which is highly unlikely. In the trivalent form, neither chromium nor arsenic would be considered human health COPCs. Regarding the potentially unacceptable risk to ecological receptors to mercury in soil, the surface and subsurface soil mercury concentrations have a relatively even distribution across the site, suggesting they are not related to the debris and may be naturally occurring. Therefore, prior to the removal action, surface and subsurface soil samples should be collected and analyzed for hexavalent chromium and mercury to determine if the removal action should expand beyond Area 2 to include soil "hot spots" for arsenic, chromium, and mercury. Also, surface soil samples should be collected and analyzed for iron and pH to determine if iron does pose a potential ecological risk. Although iron

was not identified as a refined ecological COPC in subsurface soil based on the low magnitude of its background value exceedance (ratio of 1.31), subsurface soil samples should be collected and analyzed for iron and pH as well to determine if iron does pose a potential ecological risk.

After these activities are complete, the post removal sample analyte list can be determined.

Table 4-4 summarizes the results of the decision analysis for AOC 2.

TABLE 4-1
AOC 2 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA002-A2DPB01	CAA002-A2DPB02	CAA002-A2DPB03	CAA002-A2DPB04	CAA002-A2HA01		CAA002-A2HA02
Sample ID					CAA02-A2-DPB01-00-1098	CAA02-A2-DPB02-00-1098	CAA02-A2-DPB03-00-1098	CAA02-A2-DPB04-00-1098	CAA02-A2-HA01-00-1098	CAA02-A2-HA01-00D-1098	CAA02-A2-HA02-00-1098
Sample Date					10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name											
Volatile Organic Compounds (UG/KG)											
No Detections											
Semivolatile Organic Compounds (UG/KG)											
No Detections											
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDE	--	114	5,100	1,400	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	**520 J**
4,4'-DDT	--	100	7,000	1,700	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	**640 J**
Heptachlor epoxide	--	52.9	190	53	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	**4 J**	25 UJ
Explosives (UG/KG)											
No Detections											
Total Metals (MG/KG)											
Aluminum	12,200	pH < 5.5	99,000	7,700	**1,890**	**5,710**	**8,500**	**5,650**	**6,020**	**7,300**	**6,170**
Antimony	11	78.0	41	3.1	0.58 UL	0.68 UL	0.63 UL	0.55 UL	0.56 UL	**0.74 L**	0.72 UL
Arsenic	6.36	18.0	1.6	0.39	**3**	**3.5**	**20**	**5.5**	**11.1**	**14**	**6.6**
Barium	52.9	330	19,000	1,500	**18.4 J**	**36.5 J**	**38.7 J**	**48.6**	**64.5**	**77.2**	**47.2 J**
Beryllium	0.587	40.0	200	16	**0.14 J**	**0.2 J**	**0.77 J**	**0.43 J**	**0.55 J**	**0.64 J**	**0.43 J**
Calcium	2,290	32.0	--	--	**989**	**1,720**	**2,700**	**2,840**	**3,190**	**2,670**	**3,070**
Chromium	18.2	64.0	5.6	0.29	**3.9**	**12.5**	**29.4**	**11.5**	**24.6**	**39**	**15.3**
Cobalt	9.93	13.0	30	2.3	1.5 U	**2.4 J**	**6.1 J**	**2.8 J**	**4.1 J**	**5.6 J**	**4.2 J**
Copper	4.25	70.0	4,100	310	**2.2 J**	**2.4 J**	**7.8**	**4**	**20.2**	**20.5**	**6.2**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**3,180**	**13,800**	**44,000**	**15,000**	**22,700**	**28,600**	**14,800**
Lead	17.4	120	800	400	**13.3**	**8**	**29.3**	**20**	**57.1**	**104**	**89.9**
Magnesium	1,070	--	--	--	**269**	**384**	**1,050**	**553**	**795**	**906**	**697**
Manganese	324	220	2,300	180	**62.7**	**152**	**169**	**170**	**240**	**238**	**176**
Mercury	0.111	0.10	31	2.3	**1.8**	**1.4**	**1.2 J**	**1.3**	0.11 B	0.13 B	**0.96 J**
Nickel	9.52	38.0	2,000	150	2.3 U	**4 J**	**12.1**	**5.6 J**	**10.6**	**12.5**	**6.9 J**
Potassium	708	--	--	--	**204 J**	**455**	**1,320**	**547**	**708**	**871**	**710**
Selenium	0.51	0.52	510	39	0.53 U	0.63 U	**0.64 K**	**0.71 K**	0.51 U	0.53 U	0.66 U
Sodium	521	--	--	--	**106 J**	**138 J**	**130 J**	**134 J**	**133 J**	**127 J**	**158 J**
Vanadium	27.9	130	520	39	**6 J**	**25.4**	**42.3**	**20.5**	**24.8**	**30.2**	**18.7**
Zinc	26.5	120	31,000	2,300	**9.5**	**21.3**	**55.9**	**22.8**	**49.9**	**53.6**	**96.9**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
-- - No value available

B - Analyte not detected above the level reported in blanks

BJ
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram
UG/KG - Micrograms per kilogram

TABLE 4-2
AOC 2 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA02-A2DPB01		CAA02-A2DPB02		CAA02-A2DPB03	
Sample ID					CAA02-A2-DPB01-15-1098	CAA02-A2-DPB01-03-1098	CAA02-A2-DPB02-10-1098	CAA02-A2-DPB02-03-1098	CAA02-A2-DPB03-09-1098	CAA02-A2-DPB03-03-1098
Sample Date					10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Sample Depth					30-32'	6-8'	20-22'	6-8'	18-20'	6-8'
Chemical Name										
Volatile Organic Compounds (UG/KG)										
Acetone	--	--	63,000,000	6,100,000	14 U	**66**	13 U	14 UL	13 U	11 U
Ethylbenzene	--	1,815	27,000	5,400	14 U	14 U	13 U	14 UL	13 U	11 U
Styrene	--	--	870,000	630,000	14 U	14 U	13 U	14 UL	13 U	11 U
Xylene, total	--	--	260,000	63,000	14 U	14 U	13 U	14 UL	13 U	11 U
Semivolatile Organic Compounds (UG/KG)										
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ
Di-n-butylphthalate	--	40,000	6,200,000	610,000	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDE	--	114	5,100	1,400	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ
4,4'-DDT	--	100	7,000	1,700	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ
Aroclor-1260	--	--	740	220	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ
Explosives (UG/KG)										
					ND	ND	ND	ND	ND	ND
Total Metals (MG/KG)										
Aluminum	13,000	pH < 5.5	99,000	7,700	**5,210**	**5,390**	**2,370**	**5,630**	**2,910**	**6,680**
Antimony	--	78.0	41	3.1	**0.71 L**	0.65 UL	**0.62 L**	**1.3 L**	**0.66 L**	**0.55 L**
Arsenic	5.54	18.0	1.6	0.39	**9.2**	**7.6**	**10.6**	**24.7**	**9.3**	**17.4**
Barium	84.5	330	19,000	1,500	**38.3 J**	**9 J**	**19.2 J**	**22.4 J**	**19.5 J**	**15.3 J**
Beryllium	0.52	40.0	200	16	**0.46 J**	**0.48 J**	**0.31 J**	**0.7 J**	**0.46 J**	**0.7 J**
Cadmium	--	32.0	80	7	**0.33 J**	0.05 U	**0.29 J**	**0.29 J**	**0.29 J**	0.11 B
Calcium	2,380	--	--	--	**156,000**	**499**	**152,000**	**2,580**	**229,000**	**309**
Chromium	33.7	64.0	5.6	0.29	**19.2**	**20.4**	**12.2**	**22.2**	**13.2**	**21.6**
Cobalt	5.18	13.0	30	2.3	**5.5 J**	1.7 U	**2.3 J**	**10.1 J**	**2.5 J**	**5.3 J**
Copper	3.17	70.0	4,100	310	**6.2**	**1.8 J**	**3.1**	**2.5 J**	**2.8**	**1.6 J**
Cyanide	2.7	--	2,000	160	0.27 U	0.3 U	0.27 U	0.29 U	0.24 U	0.23 U
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**18,500**	**9,590**	**13,800**	**29,400**	**21,600**	**24,100**
Lead	8.79	120	800	400	**6.1**	**8.5**	**2.8**	**6.4**	**2.1**	**5.2**
Magnesium	1,120	--	--	--	**2,620**	**432**	**2,220**	**566**	**3,390**	**1,320**
Manganese	176	220	2,300	180	**97**	**7.1**	**43.1**	**75.9**	**46**	**54**
Mercury	0.14	0.10	31	2.3	0.61 U	**1.2**	0.08 B	**0.63 J**	**0.95 J**	**0.56 J**
Nickel	17.6	38.0	2,000	150	**10.8**	2.6 U	**5 J**	**15.3**	**4.8 J**	**9.8**
Potassium	901	--	--	--	**2,080**	**594**	**2,080**	**386**	**4,720**	**1,450**
Selenium	0.64	0.52	510	39	0.56 U	0.6 U	0.54 U	0.6 U	0.56 U	0.47 U
Silver	1.1	--	510	39	0.25 U	0.27 U	0.25 U	0.27 U	0.25 U	0.21 U
Sodium	811	--	--	--	**1,460**	**132 J**	**974**	**141 J**	**1,240**	**106 J**
Thallium	--	--	1[1]	0.078[1]	0.32 U	0.32 U	0.3 U	0.32 U	0.3 U	0.25 U
Vanadium	48.3	130	520	39	**14.6**	**54.4**	**8.2 J**	**26.2**	**9.4 J**	**19.9**
Zinc	28	120	31,000	2,300	**37**	**7.3**	**21.4**	**45.8**	**19**	**32.7**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection

[1]Adjusted June 2011 RSL

[2]Lead was not shaded as exceeding the ecological screening value since the sample depth was greater than 24 inches bgs

NA - Not analyzed
ND - No detections
-- - No value available
B - Analyte not detected above the level reported in blanks
BJ - See 'B' and 'J'
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
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R - Unreliable Result
U - Analyte not detected
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UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
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TABLE 4-2
AOC 2 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA02-A2DPB04		CAA02-A2HA01		CAA02-A2HA02
Sample ID					CAA02-A2-DPB04-09-1098	CAA02-A2-DPB04-03-1098	CAA02-A2-HA01-02-1098	CAA02-A2-HA01-02D-1098	CAA02-A2-HA02-01-1098
Sample Date					10/23/98	10/23/98	10/22/98	10/22/98	10/22/98
Sample Depth					18-20'	6-8'	1-2'	1-2'	0.5-1'
Chemical Name									
Volatile Organic Compounds (UG/KG)									
Acetone	--	--	63,000,000	6,100,000	13 U	11 U	14 U	15 U	11 U
Ethylbenzene	--	1,815	27,000	5,400	13 U	11 U	14 U	15 U	11 U
Styrene	--	--	870,000	630,000	13 U	11 U	14 U	15 U	11 U
Xylene, total	--	--	260,000	63,000	13 U	11 U	14 U	15 U	11 U
Semivolatile Organic Compounds (UG/KG)									
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	430 UJ	370 UL	460 UJ	53 BJ	41 BJ
Di-n-butylphthalate	--	40,000	6,200,000	610,000	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDE	--	114	5,100	1,400	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	**120 J**
4,4'-DDT	--	100	7,000	1,700	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	**51 J**
Aroclor-1260	--	--	740	220	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
Explosives (UG/KG)									
					ND	ND	ND	ND	ND
Total Metals (MG/KG)									
Aluminum	13,000	pH < 5.5	99,000	7,700	**4,330**	**8,030**	**12,500**	**11,000**	**6,450**
Antimony	--	78.0	41	3.1	**0.64 L**	0.5 UL	**1 L**	**0.96 L**	0.5 UL
Arsenic	5.54	18.0	1.6	0.39	**7.2**	**2.7**	**30.8**	**31.1**	**4.9**
Barium	84.5	330	19,000	1,500	**29.8 J**	**12.1 J**	**33.5 J**	**32.5 J**	**35.3 J**
Beryllium	0.52	40.0	200	16	**0.6 J**	**0.25 J**	**0.96 J**	**0.85 J**	**0.36 J**
Cadmium	--	32.0	80	7	**0.37 J**	0.04 U	**0.34 J**	**0.3 J**	0.06 B
Calcium	2,380	--	--	--	**67,000**	**1,010**	**1,690**	**1,720**	**1,290**
Chromium	33.7	64.0	5.6	0.29	**19.2**	**27.5**	**43.2**	**40.7**	**12.4**
Cobalt	5.18	13.0	30	2.3	**4.6 J**	**3.5 J**	**7 J**	**6.5 J**	**3.7 J**
Copper	3.17	70.0	4,100	310	1 U	**2 J**	**4.2**	**3.7**	**4.7**
Cyanide	2.7	--	2,000	160	0.27 U	0.22 U	0.29 U	0.31 U	0.3 U
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**45,300**	**11,000**	**42,000**	**38,400**	**14,700**
Lead	8.79	120	800	400	**3.8**	**3.7**	**11.3**	**9.8**	**18.9**
Magnesium	1,120	--	--	--	**2,860**	**1,180**	**1,510**	**1,220**	**462**
Manganese	176	220	2,300	180	**134**	**12.6**	**79.5**	**74.6**	**99.9**
Mercury	0.14	0.10	31	2.3	**0.69 J**	**0.94 J**	0.08 B	**0.89 J**	**1**
Nickel	17.6	38.0	2,000	150	**6.5 J**	**4.5 J**	**21.8**	**21.2**	**6.6 J**
Potassium	901	--	--	--	**4,520**	**1,100**	**1,900**	**1,320**	**474**
Selenium	0.64	0.52	510	39	0.55 U	0.46 U	**0.68 K**	0.63 U	0.46 U
Silver	1.1	--	510	39	0.25 U	0.21 U	0.27 U	0.29 U	0.21 U
Sodium	811	--	--	--	**252**	**102 J**	**136 J**	**155 J**	**109 J**
Thallium	--	--	1[1]	0.078[1]	0.29 UL	0.26 U	0.32 U	0.33 U	0.24 U
Vanadium	48.3	130	520	39	**14.8**	**32.7**	**39.8**	**34.9**	**18.6**
Zinc	28	120	31,000	2,300	**32.1**	**17.9**	**49.9**	**47.4**	**49.8**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection

[1]Adjusted June 2011 RSL

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NA - Not analyzed
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MG/KG - Milligrams per kilogram
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TABLE 4-2
AOC 2 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA02-A2TP01F			CAA02-A2TP01N	CAA02-A2TP02F	CAA02-A2TP02N	CAA02-A2TP03F
Sample ID					CAA02-A2-TP01-F1-1199	CAA02-A2-TP01-F-1199	CAA02-A2-TP01-FD-1199	CAA02-A2-TP01-N-1199	CAA02-A2-TP02-F-1199	CAA02-A2-TP02-N-1199	CAA02-A2-TP03-F-1199
Sample Date					11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99
Sample Depth					3.5-4'	3.5-4'	3.5-4'	4.8-5.4'	3.5-4'	6-7'	2-3'
Chemical Name											
Volatile Organic Compounds (UG/KG)											
Acetone	--	--	63,000,000	6,100,000	NA	35 B	12.2 U	9 B	5 B	14 B	17 B
Ethylbenzene	--	1,815	27,000	5,400	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U
Styrene	--	--	870,000	630,000	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U
Xylene, total	--	--	260,000	63,000	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U
Semivolatile Organic Compounds (UG/KG)											
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	800 U	NA	**56 J**	390 U	**44 J**	**43 J**	**2,500**
Di-n-butylphthalate	--	40,000	6,200,000	610,000	800 U	NA	**76 J**	390 U	**65 J**	**50 J**	**68 J**
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDE	--	114	5,100	1,400	4 UL	NA	**5.4 J**	3.9 U	3.9 UL	4.1 U	4 UL
4,4'-DDT	--	100	7,000	1,700	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL
Aroclor-1260	--	--	740	220	**200**	NA	**310**	39 U	39 UL	41 U	40 UL
Explosives (UG/KG)											
					NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)											
Aluminum	13,000	pH < 5.5	99,000	7,700	**12,300 L**	NA	**8,480 L**	**9,150 L**	**6,160 L**	**13,700 L**	**9,960 L**
Antimony	--	78.0	41	3.1	0.84 B	NA	0.69 B	0.51 U	2 B	0.51 UJ	12.7 U
Arsenic	5.54	18.0	1.6	0.39	**3.3**	NA	**5**	**9.4**	**3**	**4.2 L**	**7.9**
Barium	84.5	330	19,000	1,500	**53.1**	NA	**35.8**	**30.7 J**	**32.2 J**	**26.6 J**	**31.7 J**
Beryllium	0.52	40.0	200	16	0.6 B	NA	0.46 B	0.59 B	0.38 B	0.9 B	0.65 B
Cadmium	--	32.0	80	7	2.1 U	NA	1.8 U	0.08 U	**12.3**	0.16 U	2.1 U
Calcium	2,380	--	--	--	**36,400**	NA	**13,100**	**801 J**	**732 J**	359 B	**1,590**
Chromium	33.7	64.0	5.6	0.29	**37.5**	NA	**17.8**	**23.3**	**94.5**	**60.3**	**24.5**
Cobalt	5.18	13.0	30	2.3	**4.1 J**	NA	**4 J**	**3.8 J**	**3.4 J**	**6.6 J**	**5.5 J**
Copper	3.17	70.0	4,100	310	**58.3**	NA	**26.7**	4.6 B	**318**	**137 J**	5.3 B
Cyanide	2.7	--	2,000	160	0.6 UL	NA	0.6 UL	0.02 UL	**0.95 J**	0.02 UL	0.6 UL
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**37,500 L**	NA	**25,400 L**	**20,700 L**	**21,100 L**	**38,400 L**	**24,300 L**
Lead	8.79	120	800	400	**11.4**	NA	**11.2**	**8.3**	**222**[2]	**14.6 J**	**10.3**
Magnesium	1,120	--	--	--	**2,920**	NA	**825 J**	**456 J**	**391 J**	**1,130 J**	**732 J**
Manganese	176	220	2,300	180	**96.2**	NA	**112**	**54.7**	**104**	**73.7 J**	**100**
Mercury	0.14	0.10	31	2.3	**0.04 J**	NA	**0.04 J**	**0.04 J**	**0.03 J**	0.03 U	**0.03 J**
Nickel	17.6	38.0	2,000	150	**7.2 J**	NA	**11.2**	5.8 B	**11.8**	**12.1**	**12.4**
Potassium	901	--	--	--	**1,120**	NA	**666 J**	**711 J**	**312 J**	**1,560**	**852 J**
Selenium	0.64	0.52	510	39	1 U	NA	0.9 U	0.69 U	1.1 U	0.7 U	1.1 U
Silver	1.1	--	510	39	**11**	NA	7 B	6.8 B	**19.7**	**17.8 L**	6.5 B
Sodium	811	--	--	--	194 B	NA	70.4 B	18 B	25.9 B	38.5 B	30.6 B
Thallium	--	--	1[1]	0.078[1]	0.79 B	NA	1.8 UL	0.55 UL	0.64 B	**0.84 L**	2.1 UL
Vanadium	48.3	130	520	39	**29.7**	NA	**23.9**	**41.8**	**15.4**	**36.8 J**	**31.4**
Zinc	28	120	31,000	2,300	**120**	NA	69.9 B	17.9 B	**127**	42.5 B	44.8 B

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
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Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA02-A2TP03N	CAA02-A2TP04F	CAA02-A2TP04N	CAA02-A2TP05F	CAA02-A2TP05N		CAA02-A2TP06F	CAA02-A2TP06N
Sample ID					CAA02-A2-TP03-N-1199	CAA02-A2-TP04-F-1199	CAA02-A2-TP04-N-1199	CAA02-A2-TP05-F-1199	CAA02-A2-TP05-N-1199	CAA02-A2-TP05-ND-1199	CAA02-A2-TP06-F-1199	CAA02-A2-TP06-N-1199
Sample Date					11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99
Sample Depth					3.5-4'	2.5-3'	3.5-4'	1.5-2'	3.75-4'	3.75-4'	2-2.5'	3.5-4'
Chemical Name												
Volatile Organic Compounds (UG/KG)												
Acetone	--	--	63,000,000	6,100,000	6 B	17 B	6 B	12.2 UL	6 B	17 B	12 B	36 B
Ethylbenzene	--	1,815	27,000	5,400	12.6 U	11.8 U	12.2 U	**10 J**	13.0 U	10 UL	12.8 U	**0.7 J**
Styrene	--	--	870,000	630,000	12.6 U	11.8 U	12.2 U	12.2 UL	13.0 U	10 UL	12.8 U	**4 J**
Xylene, total	--	--	260,000	63,000	12.6 U	11.8 U	**1 J**	12.2 UL	**2 J**	**2 J**	12.8 U	**2 J**
Semivolatile Organic Compounds (UG/KG)												
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	**42 J**	**660**	410 U	**150 J**	410 U	410 U	420 U	400 U
Di-n-butylphthalate	--	40,000	6,200,000	610,000	**46 J**	**79 J**	**46 J**	**65 J**	**51 J**	410 U	420 U	**47 J**
Pesticide/Polychlorinated Biphenyls (UG/KG)												
4,4'-DDE	--	114	5,100	1,400	4.1 UL	4 UL	4.2 UL	3.9 UL	4.1 U	4.2 UL	4.2 UL	4 UL
4,4'-DDT	--	100	7,000	1,700	4.1 UL	4 UL	4.2 UL	3.9 UL	4.1 U	4.2 UL	4.2 UL	4 UL
Aroclor-1260	--	--	740	220	41 UL	40 UL	42 UL	39 UL	41 U	42 UL	42 UL	40 UL
Explosives (UG/KG)												
					NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)												
Aluminum	13,000	pH < 5.5	99,000	7,700	**16,100 L**	**6,650 L**	**11,400 L**	**5,120 L**	**12,100 L**	**12,900 L**	**11,800 L**	**11,600 L**
Antimony	--	78.0	41	3.1	**0.63 J**	0.46 B	0.81 B	11.9 U	0.64 B	0.5 B	11.6 U	0.84 B
Arsenic	5.54	18.0	1.6	0.39	**36.5**	**9.2**	**36.1**	**1.9 J**	**16**	**16**	**4.3**	**21.2**
Barium	84.5	330	19,000	1,500	**50.2 J**	**31.6 J**	**66**	**26 J**	**17.2 J**	**17.5 J**	**44.5**	**29.7 J**
Beryllium	0.52	40.0	200	16	**1.3 J**	0.39 B	0.81 B	0.23 B	**0.96 J**	**0.92 J**	0.45 B	**0.97 J**
Cadmium	--	32.0	80	7	0.17 U	0.9 U	0.08 UL	1 U	0.08 UL	0.08 UL	1 U	0.08 UL
Calcium	2,380	--	--	--	**494 J**	**1,150**	**528 J**	**885 J**	**153 J**	**183 J**	**1,180**	**472 J**
Chromium	33.7	64.0	5.6	0.29	**44**	**15.1**	**43.3**	**9.2**	**34.8**	**38.8**	**20.3**	**29.8**
Cobalt	5.18	13.0	30	2.3	**10.2 J**	**3 J**	**4.6 J**	**2.7 J**	**5.8 J**	**6.3 J**	**3.8 J**	**9.2 J**
Copper	3.17	70.0	4,100	310	6.5 B	5.5 B	5.6 B	3.1 B	6.8 B	6.2 B	**14.6**	**134**
Cyanide	2.7	--	2,000	160	0.02 UL	0.6 UL	0.02 UL	0.6 UL	0.02 UL	0.02 UL	0.6 UL	0.02 UL
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**38,800 L**	**15,000 L**	**24,600**	**10,800 L**	**33,800**	**36,700**	**25,800 L**	**34,300**
Lead	8.79	120	800	400	**12 J**	**10.8**	**16.2**	**8**	**9**	**9.1**	**11.8**	**12.6**
Magnesium	1,120	--	--	--	**1,530**	**432 J**	**1,080 J**	**293 J**	**954 J**	**1,020 J**	**541 J**	**844 J**
Manganese	176	220	2,300	180	**84.5 J**	**94.7**	**13.7**	**103**	**45.6**	**44.6**	**121**	**70.9**
Mercury	0.14	0.10	31	2.3	0.03 U	**0.04 J**	0.03 B	**0.06 J**	0.05 B	0.03 B	**0.05 J**	**0.07 J**
Nickel	17.6	38.0	2,000	150	**18.5**	**5.1 J**	**7.4 J**	**4.3 J**	**14.4**	**16.3**	**8.4**	**24.4**
Potassium	901	--	--	--	**1,820**	**429 J**	**1,650**	**332 J**	**1,270**	**1,340**	**676 J**	**1,130**
Selenium	0.64	0.52	510	39	0.73 U	0.9 U	0.7 UL	1 U	0.69 UL	0.69 UL	1 U	0.67 UL
Silver	1.1	--	510	39	**13 L**	3.9 B	9 B	2.7 B	**11.7 J**	**13.7 J**	7.1 B	**12 J**
Sodium	811	--	--	--	57.5 B	31.3 B	25.9 B	20.4 B	39.5 B	33.9 B	32.6 B	36 B
Thallium	--	--	1[1]	0.078[1]	0.58 UL	1.9 UL	1.2 B	2 UL	0.85 B	1.4 B	0.78 B	0.88 B
Vanadium	48.3	130	520	39	**69.2 J**	**20.9**	**37.6**	**16.8**	**35.5**	**35.4**	**36.9**	**36.7**
Zinc	28	120	31,000	2,300	52.4 B	60.4 B	42.8 B	23.7 B	39.8 B	47.9 B	**96.2**	61.4 B

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection

[1]Adjusted June 2011 RSL

[2]Lead was not shaded as exceeding the ecological screening value since the sample depth was greater than 24 inches bgs

NA - Not analyzed
ND - No detections
-- - No value available
B - Analyte not detected above the level reported in blanks
BJ - See 'B' and 'J'
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
UG/KG - Micrograms per kilogram

TABLE 4-3
AOC 2 Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW CC AQUIFER	CLEAN MCL-Groundwater (Dec. 2010)	CLEAN RSLs Tapwater Adjusted (Nov. 2010)	CAA02-A2DPW01	CAA02-A2DPW02	CAA02-A2DPW03		CAA02-A2DPW04
Sample ID				CAA02-A2DPW01-1098	CAA02-A2DPW02-1098	CAA02-A2DPW03-1098	CAA02-A2DPW03P-1098	CAA02-A2DPW04-1098
Sample Date				10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name								
Volatile Organic Compounds (UG/L)								
No Detections								
Semivolatile Organic Compounds (UG/L)								
Diethylphthalate	--	--	2,900	**1 J**	10 U	10 U	10 U	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)								
No Detections								
Explosives (UG/L)								
No Detections								
Total Metals (UG/L)								
Aluminum	2,230	--	3,700	**189,000**	**59,300**	**2,110**	**2,210**	**96,700**
Antimony	18.8	6	1.5	**13.8**	**7.7**	2.4 U	2.4 U	**11.3**
Arsenic	2.28	10	0.045	**181**	**89.9**	**3.7 J**	**5.1 J**	**430**
Barium	118	2,000	730	**510**	**195 J**	**36.5 J**	**38.3 J**	**275**
Beryllium	2.45	4	7.3	**9.6**	**3.3 J**	0.2 U	0.2 U	**5.7**
Cadmium	0.605	5	1.8	**8.7**	**5.9**	4.3 U	4.3 U	**6.5**
Calcium	158,000	--	--	**2,520,000**	**722,000**	**153,000**	**160,000**	**1,230,000**
Chromium	15.1	100	0.043	**595**	**229**	**9.6 J**	**10**	**364**
Cobalt	20.6	--	1.1	**73.7**	**32.2 J**	6.3 U	6.3 U	**45.6 J**
Copper	12.2	1,300	150	**99.5**	**37**	4.1 U	4.1 U	**45.9**
Iron	3,590	--	2,600	**380,000**	**133,000**	**5,550**	**5,630**	**262,000**
Lead	21.3	15	--	**94.6**	**36.1**	1 U	1.2 B	**53.7**
Magnesium	3,600	--	--	**51,900**	**17,900**	**2,270**	**2,340**	**31,800**
Manganese	57.9	--	88	**1,360**	**394**	**36.7**	**37.5**	**684**
Nickel	11.4	--	73	**170**	**70.7**	9.6 U	9.6 U	**109**
Potassium	3,490	--	--	**55,400**	**18,800**	**1,780 J**	**1,710 J**	**36,500**
Selenium	--	50	18	2.2 U	**4.6 K**	2.2 U	**2.9 K**	2.2 U
Sodium	9,920	--	--	**18,900**	**12,600**	**7,190**	**7,290**	**13,100**
Thallium	--	2	0.037[1]	**1.2 L**	**2 J**	1.2 U	1.2 U	1.2 U
Vanadium	26.2	--	18	**417**	**205**	**6.1 J**	**4.8 J**	**309**
Zinc	4.52	--	1,100	**667**	**264**	**13.5 J**	**13.3 J**	**424**
Dissolved Metals (UG/L)								
Aluminum, Dissolved	100	--	3,700	**210**	**172 J**	**167 J**	**193 J**	**159 J**
Arsenic, Dissolved	1.37	10	0.045	**2.4 J**	**3.6 J**	1.8 U	1.8 U	**5.5 J**
Barium, Dissolved	127	2,000	730	**35.2 J**	**36.4 J**	**27.3 J**	**27 J**	**23.2 J**
Calcium, Dissolved	148,000	--	--	**158,000**	**143,000**	**132,000**	**132,000**	**133,000**
Copper, Dissolved	3	1,300	150	4.1 U	**4.2 J**	4.1 U	**4.5 J**	**6.5 J**
Iron, Dissolved	631	--	2,600	**56.6 J**	**53.2 J**	**92.7 J**	**86.2 J**	**208**
Magnesium, Dissolved	3,880	--	--	**2,240**	**3,730**	**1,600**	**1,620**	**1,710**
Manganese, Dissolved	49.5	--	88	**164**	**317**	**24.1**	**23.8**	**25**
Potassium, Dissolved	1,710	--	--	**1,000 J**	**2,060 J**	**869 J**	**861 J**	**1,060 J**
Selenium, Dissolved	9.1	50	18	2.2 U	**7.5 K**	2.2 U	2.2 U	2.2 U
Sodium, Dissolved	10,000	--	--	**6,980**	**9,840**	**7,040**	**6,910**	**6,080**
Zinc, Dissolved	--	--	1,100	**7.1 J**	**8 J**	6.8 U	**11.8 J**	**7.5 J**

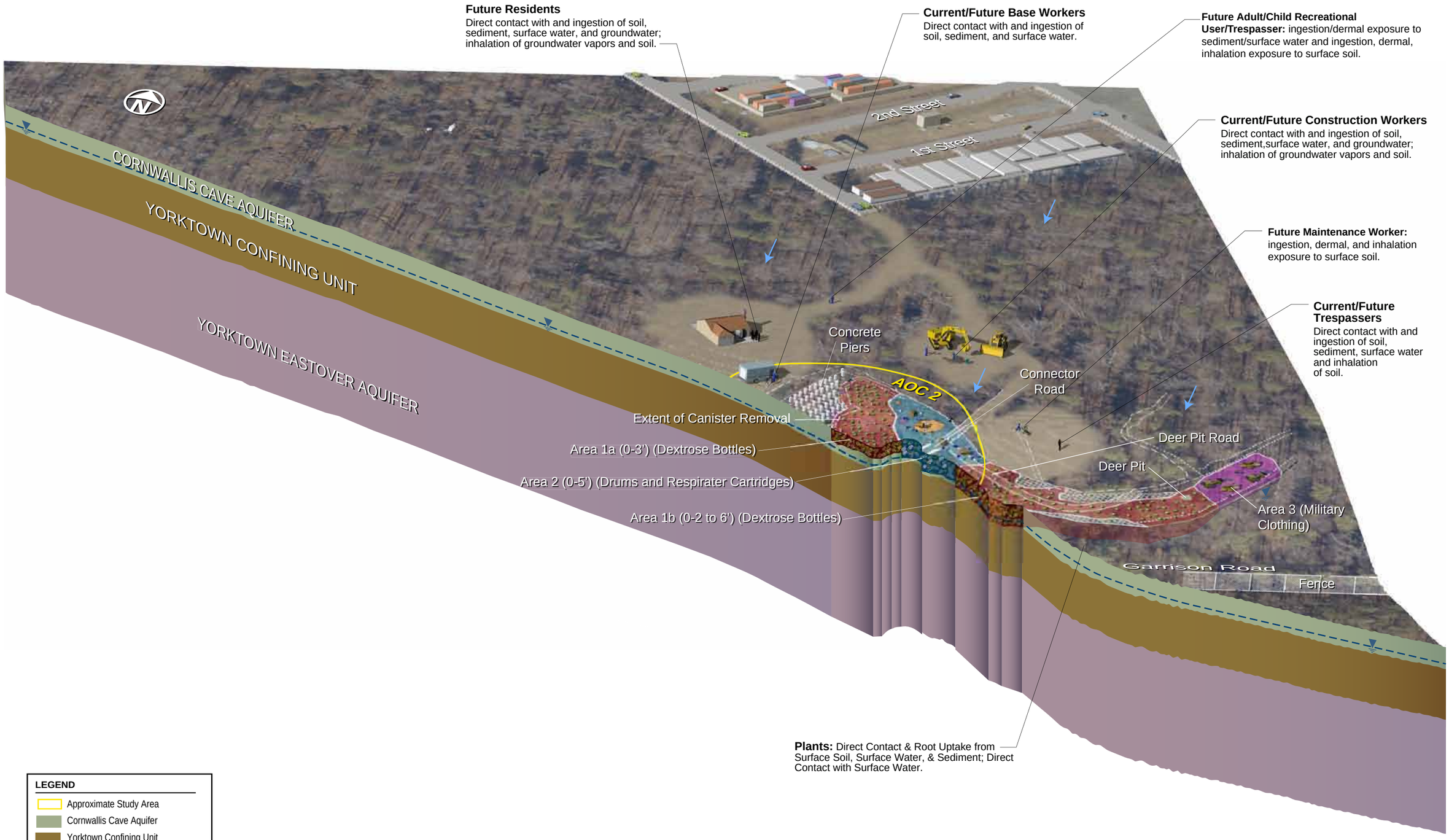
Notes:

Exceeds Background
Exceeds BKG & Tapwater RSL
Exceeds BKG & MCL
Exceeds BKG, Tapwater RSL & MCL
Bold indicates detection
[1]Adjusted June 2011 Tapwater RSL value
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UG/L - Micrograms per liter

TABLE 4-4
AOC 2 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1 Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Background or Non-inorganics Detected?	Step 1 Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
AOC 2 Surface Soil	Yes	VOCs	No (no detections)	N/A	N/A	Yes - conduct an interim removal action to remove the Area 2 waste (drums and respiratory cartridges) and collect post removal soil samples (analyte list to be determined prior to the removal). Collect surface and subsurface soil samples and analyze for hexavalent chromium to determine if the removal action should include arsenic and chromium "hot spots" (if chromium is in the trivalent form, neither chromium nor arsenic would be HH COPCs). Collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots." Collect surface and subsurface soil samples and analyze for iron and pH to determine if iron does pose a potential ecological risk and if the removal action should include iron "hot spots." NFA for groundwater. (A consensus letter will be prepared for CAX Partnering Team review to capture the NFA recommendation, including a risk assessment using existing data.) Note: The one exceeding detection of 4,4'-DDT in surface soil (eco COPC) and the HH COPCs in surface and subsurface soil, except for arsenic and chromium, are located in Area 2, where the proposed removal action will be conducted.
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	Yes	Yes - 2 pesticides (4,4'-DDE and 4,4'-DDT - potential eco risk only)	Yes - 4,4'-DDT (potential eco risk only)	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 7 inorganics (As - potential HH and eco risks; Cr, Fe, V - potential HH risk; Mn, Hg, Se - potential eco risk). Also, Fe was identified as an initial eco COPC since no soil pH data was available	Yes - 1 inorganic (Hg - potential eco risk only). Additionally, Fe was retained as an eco COPC since pH data was not available.	
AOC 2 Subsurface Soil	Yes	VOCs	No	N/A	N/A	
		SVOCs	No	N/A	N/A	
		Pesticides	Yes	Yes - 1 pesticide (4,4'-DDE - potential eco risk only)	No, based on eco risk screening	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Yes - 11 inorganics (As - potential HH and eco risks; Al, Cd, Cr, Co, Cu, Fe, Th, V - potential HH risk; Hg, Se - potential eco risk) Also, Fe was identified as an initial eco COPC since no soil pH data was available	Yes - 2 inorganics (Hg - potential eco risk only; Th - potential HH risk only)	
AOC 2 Groundwater	Yes	VOCs	No	N/A	N/A	
		SVOCs	No	N/A	N/A	
		Pesticides	No	N/A	N/A	
		PCBs	No	N/A	N/A	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Yes - 12 total inorganics (Al, As, Be, Cd, Cr, Co, Fe, Pb, Mn, Ni, Th, V - potential HH risk only) and 2 dissolved inorganics (Ar and Mn - potential HH risk)	No - 2 total inorganics (As and Mn) exceed the HH risk value in the dissolved phase, but can risk manage	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern



LEGEND

- Approximate Study Area
- Cornwallis Cave Aquifer
- Yorktown Confining Unit
- Yorktown Eastover Aquifer
- Anticipated Surface Water Flow
- Water Table

FIGURE 4-1
AOC 2 Conceptual Site Model
Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex,
Williamsburg, Virginia

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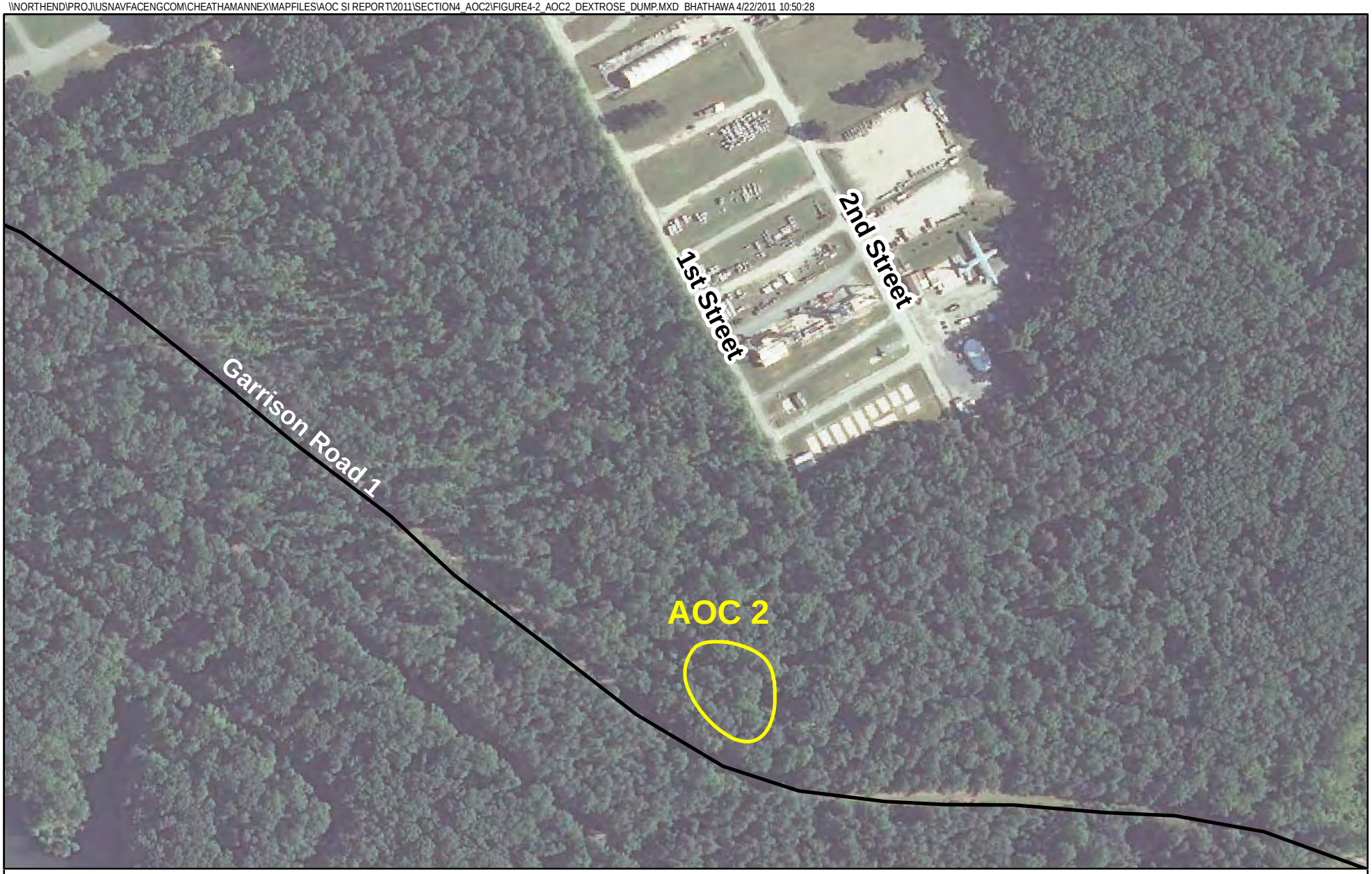
ES033011003122VBO CSMCAXAOC_Fig4-1_CMS_Site_AOC2_rev1.ai 04/05/11 LED

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION4_AOC2\FIGURE4-2_AOC2_DEXTROSE_DUMP.MXD BHATHAWA 4/22/2011 10:50:28



Legend

Approximate Study Area Boundary

CAX Boundary / Fenceline

N
W E
S

0 150 300
Feet

Figure 4-2
AOC 2 Dextrose Dump and Vicinity Detail
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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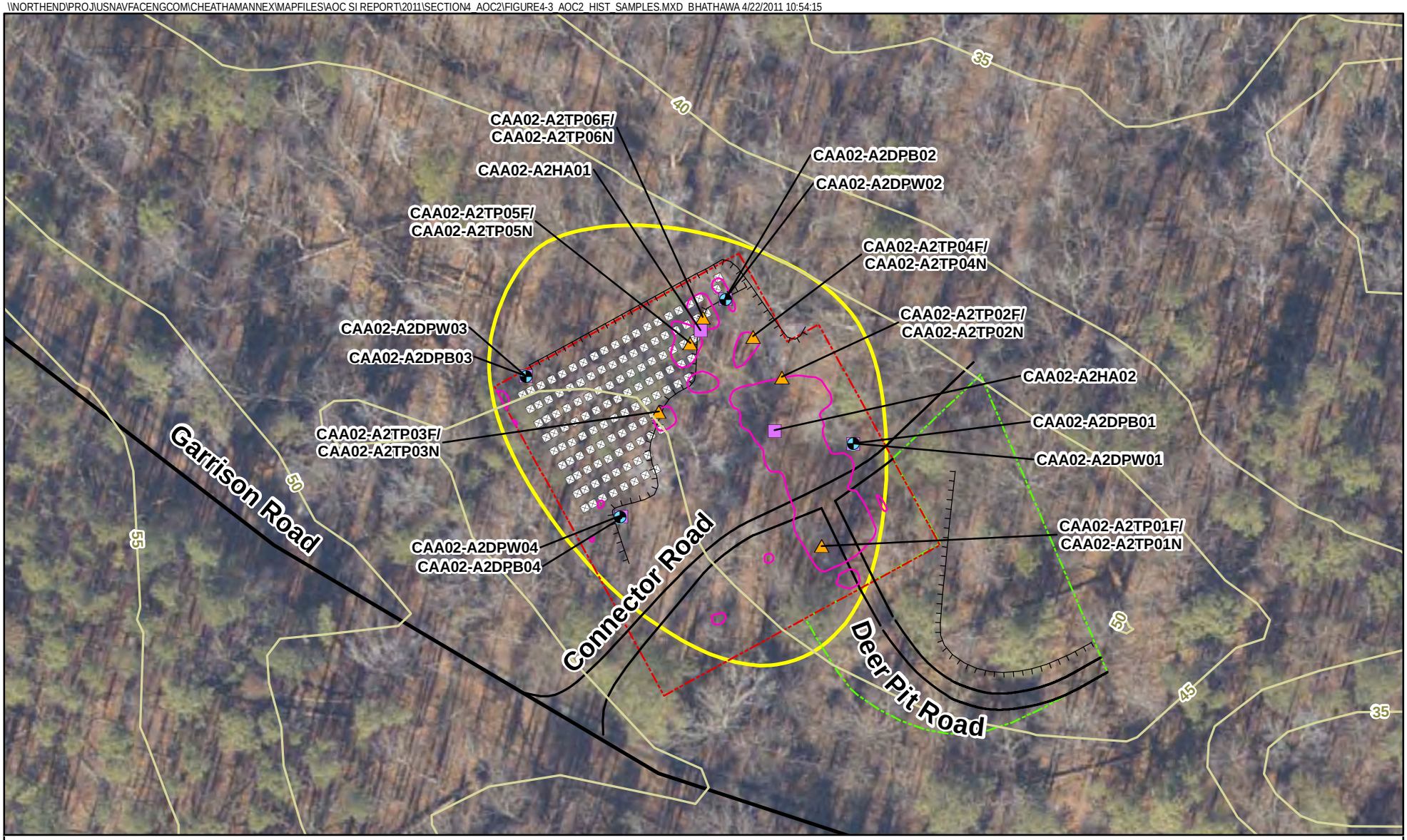
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION4_AOC2\FIGURE4-3_AOC2_HIST_SAMPLES.MXD BHATHAWA 4/22/2011 10:54:15



Legend

- Test Pit Locations
- Monitoring Wells
- Soil Sample Locations
- Study Area Boundary
- CAX Boundary / Fenceline
- 1998 Areas of Significant Geophysical Anomalies
- 1998 Area of Geophysical Survey
- 1998 Area of Geophysical Reconnaissance
- Berm
- Topographic Surface Contour (feet above mean sea level)
- Concrete Piers

N
W E
S

0 35 70
Feet

Figure 4-3
AOC 2 Comprehensive Investigation Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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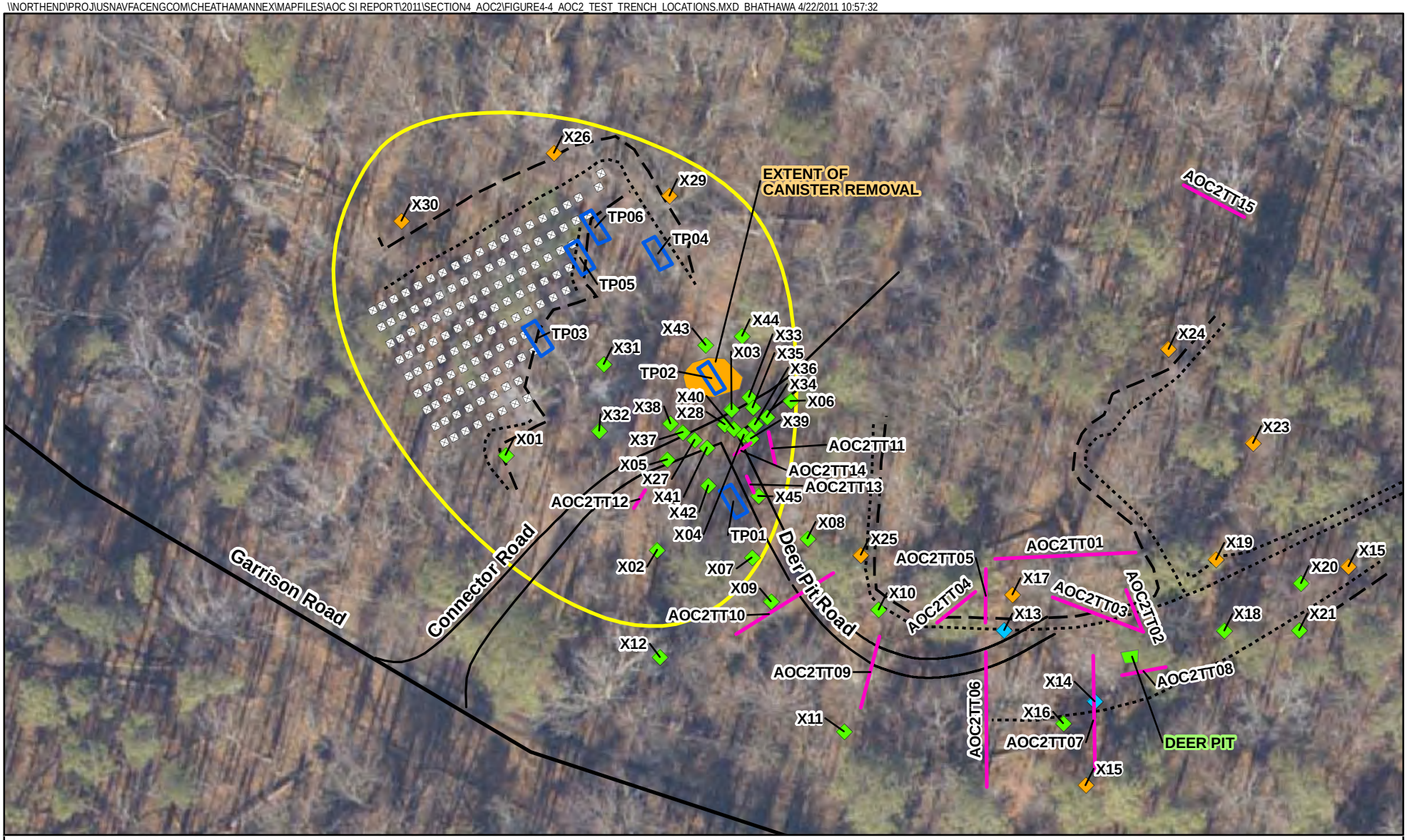
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION4_AOC2\FIGURE4-4_AOC2_TEST_TRENCH_LOCATIONS.MXD BHATHAWA 4/22/2011 10:57:32



Legend

- Study Area Boundary
- CAX Boundary / Fenceline
- Concrete Piers
- Top of Bank
- Toe of Slope
- Field Investigation Test Pit (November 1999)
- Test Trench (November 2001)
- Exploratory Test Pit (Jan./Feb. 2000)
- Exploratory Test Hole (January 2000)
- Exposure Observation Point (January 2000)

N W E S

0 30 60 Feet

Figure 4-4
AOC 2 Location of Test Trenches
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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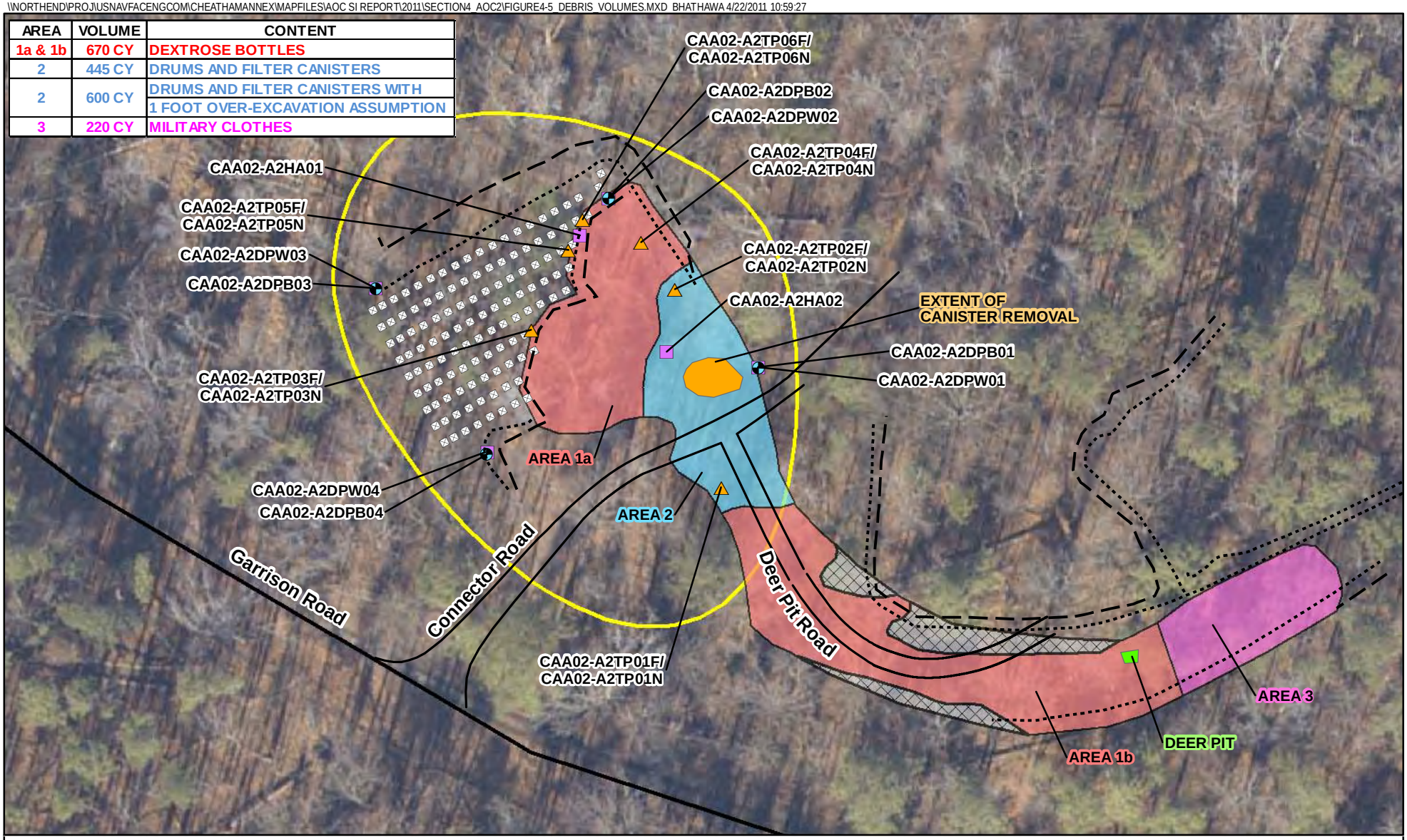
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION4_AOC2\FIGURE4-5_DEBRIS_VOLUMES.MXD BHATHAWA 4/22/2011 10:59:27



AREA	VOLUME	CONTENT
1a & 1b	670 CY	DEXTROSE BOTTLES
2	445 CY	DRUMS AND FILTER CANISTERS
2	600 CY	DRUMS AND FILTER CANISTERS WITH 1 FOOT OVER-EXCAVATION ASSUMPTION
3	220 CY	MILITARY CLOTHES

Legend

- Test Pit Locations
- Monitoring Wells
- Soil Sample Locations
- Study Area Boundary
- CAX Boundary / Fenceline
- Concrete Piers
- Top of Bank
- Toe of Slope

N W E S

0 30 60 Feet

Figure 4-5
AOC 2 Estimated Debris/Waste Volumes
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\SECTION4_AOC2\FIGURE4-6_AOC2_SS_EXCEEDANCE_RESULTS.MXD MUNWIN 6/29/2011 2:03:59 PM

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Pesticides/PCBs (UG/KG)				
4,4'-DDE	--	114	5,100	1,400
4,4'-DDT	--	100	7,000	1,700
Total Metals (MG/KG)				
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Iron	19,900	pH < 5 or pH > 8	72,000	5,500
Mercury	0.111	0.10	31	2.3
Selenium	0.51	0.52	510	39
Vanadium	27.9	130	520	39

Station ID	CAA002-A2DPB02
Sample ID	CAA02-A2-DPB02-00-1098
Sample Date	10/22/98
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Mercury	1.4

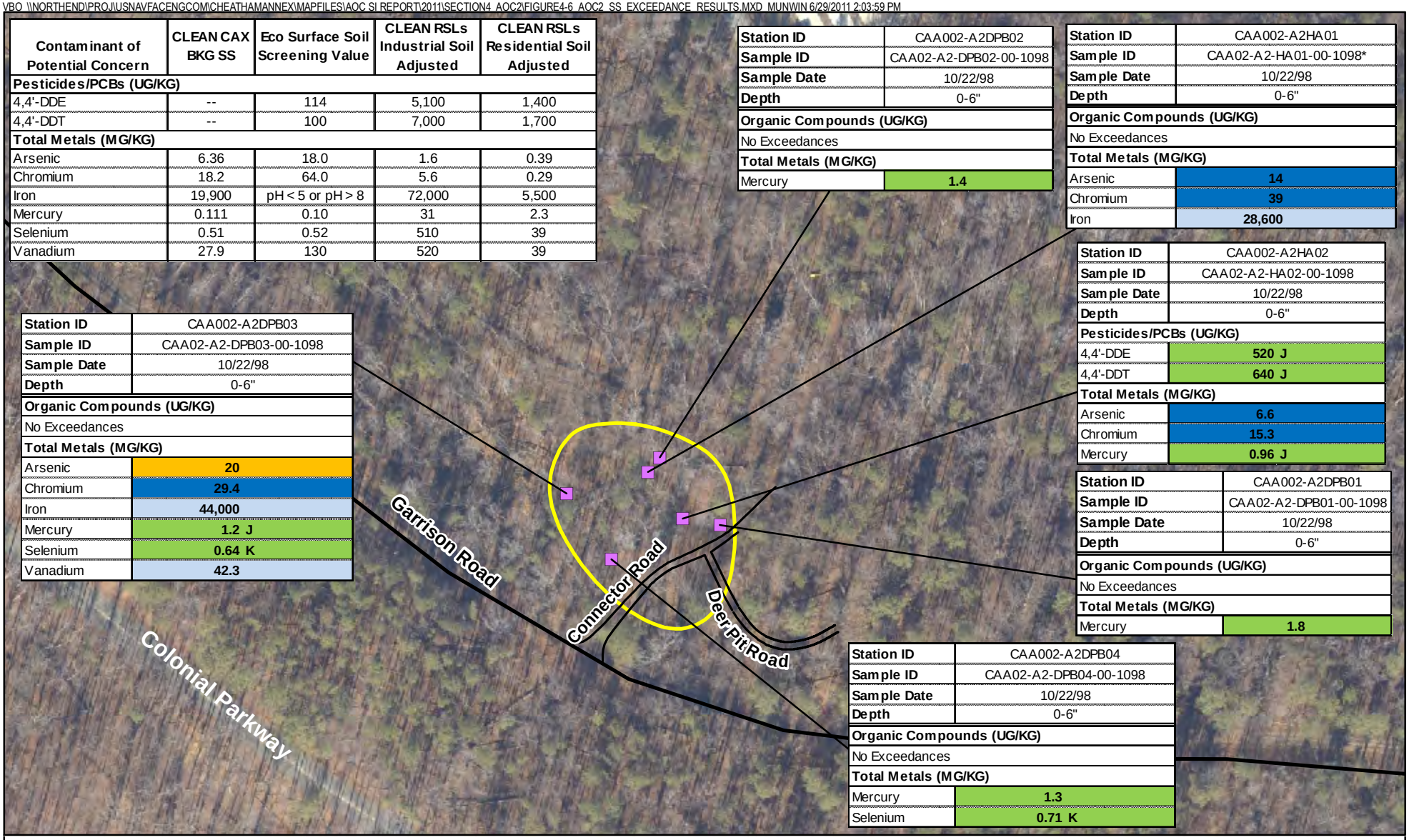
Station ID	CAA002-A2HA01
Sample ID	CAA02-A2-HA01-00-1098*
Sample Date	10/22/98
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	14
Chromium	39
Iron	28,600

Station ID	CAA002-A2HA02
Sample ID	CAA02-A2-HA02-00-1098
Sample Date	10/22/98
Depth	0-6"
Pesticides/PCBs (UG/KG)	
4,4'-DDE	520 J
4,4'-DDT	640 J
Total Metals (MG/KG)	
Arsenic	6.6
Chromium	15.3
Mercury	0.96 J

Station ID	CAA002-A2DPB03
Sample ID	CAA02-A2-DPB03-00-1098
Sample Date	10/22/98
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	20
Chromium	29.4
Iron	44,000
Mercury	1.2 J
Selenium	0.64 K
Vanadium	42.3

Station ID	CAA002-A2DPB01
Sample ID	CAA02-A2-DPB01-00-1098
Sample Date	10/22/98
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Mercury	1.8

Station ID	CAA002-A2DPB04
Sample ID	CAA02-A2-DPB04-00-1098
Sample Date	10/22/98
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Mercury	1.3
Selenium	0.71 K



Legend

- Soil Sample Location
- Study Area Boundary
- CAX Boundary / Fenceline

Notes:

- Exceeds BKG and ECO
- Exceeds BKG and Res RSL
- Exceeds BKG, Res, and Ind RSLs
- Exceeds BKG, ECO, Res and Ind RSLs

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N W E S

0 75 150 Feet

Figure 4-6
AOC 2 Surface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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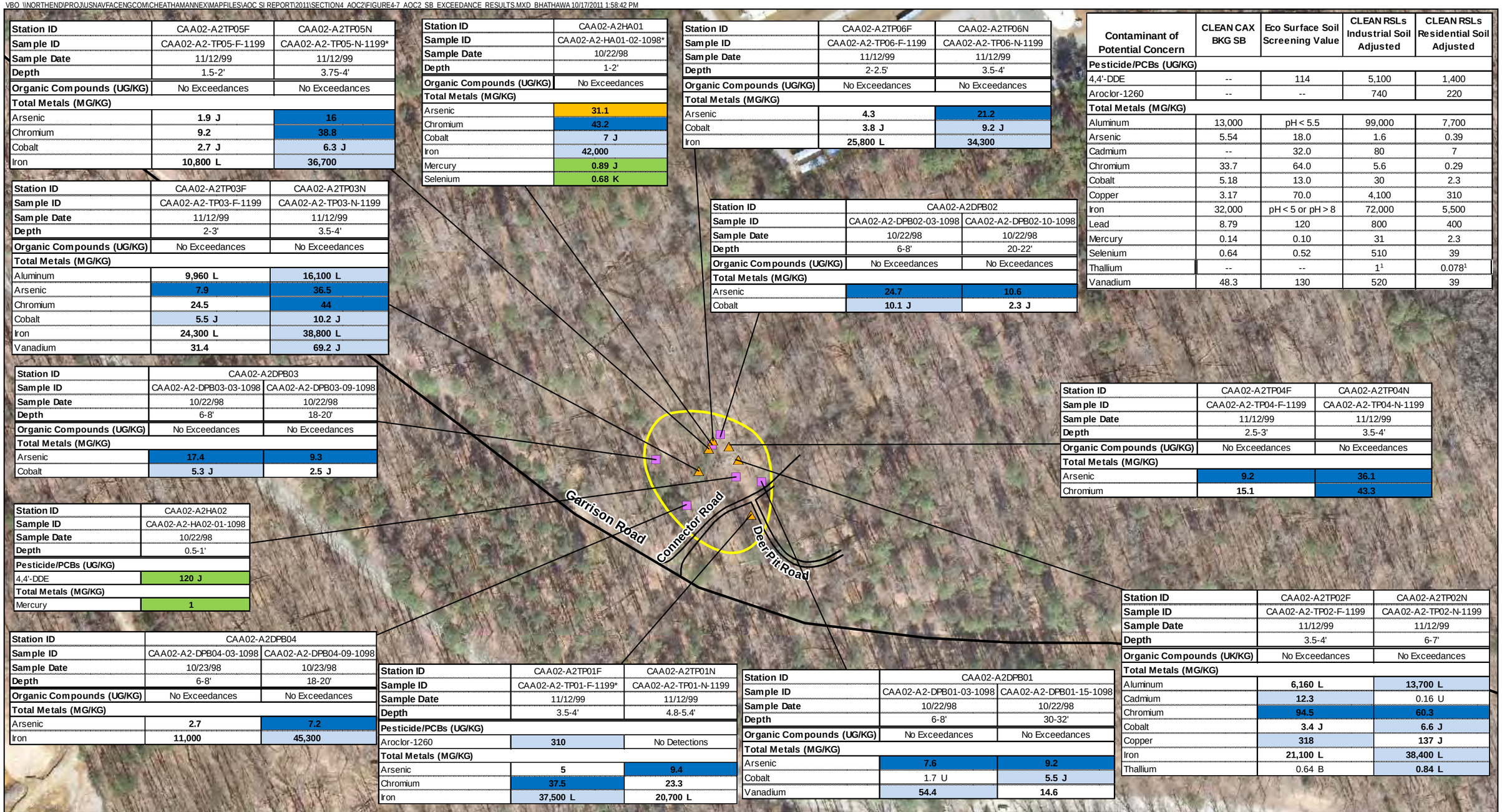


Station ID	CAA02-A2TP05F	CAA02-A2TP05N
Sample ID	CAA02-A2-TP05-F-1199	CAA02-A2-TP05-N-1199*
Sample Date	11/12/99	11/12/99
Depth	1.5-2'	3.75-4'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	1.9 J	16
Chromium	9.2	38.8
Cobalt	2.7 J	6.3 J
Iron	10,800 L	36,700

Station ID	CAA02-A2HA01
Sample ID	CAA02-A2-HA01-02-1098*
Sample Date	10/22/98
Depth	1-2'
Organic Compounds (UG/KG)	No Exceedances
Total Metals (MG/KG)	
Arsenic	31.1
Chromium	43.2
Cobalt	7 J
Iron	42,000
Mercury	0.89 J
Selenium	0.68 K

Station ID	CAA02-A2TP06F	CAA02-A2TP06N
Sample ID	CAA02-A2-TP06-F-1199	CAA02-A2-TP06-N-1199
Sample Date	11/12/99	11/12/99
Depth	2-2.5'	3.5-4'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	4.3	21.2
Cobalt	3.8 J	9.2 J
Iron	25,800 L	34,300

Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Pesticide/PCBs (UG/KG)				
4,4'-DDE	--	114	5,100	1,400
Aroclor-1260	--	--	740	220
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Arsenic	5.54	18.0	1.6	0.39
Cadmium	--	32.0	80	7
Chromium	33.7	64.0	5.6	0.29
Cobalt	5.18	13.0	30	2.3
Copper	3.17	70.0	4,100	310
Iron	32,000	pH < 5 or pH > 8	72,000	5,500
Lead	8.79	120	800	400
Mercury	0.14	0.10	31	2.3
Selenium	0.64	0.52	510	39
Thallium	--	--	1[1]	0.078[1]
Vanadium	48.3	130	520	39

Station ID	CAA02-A2TP03F	CAA02-A2TP03N
Sample ID	CAA02-A2-TP03-F-1199	CAA02-A2-TP03-N-1199
Sample Date	11/12/99	11/12/99
Depth	2-3'	3.5-4'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Aluminum	9,960 L	16,100 L
Arsenic	7.9	36.5
Chromium	24.5	44
Cobalt	5.5 J	10.2 J
Iron	24,300 L	38,800 L
Vanadium	31.4	69.2 J

Station ID	CAA02-A2DPB02	
Sample ID	CAA02-A2-DPB02-03-1098	CAA02-A2-DPB02-10-1098
Sample Date	10/22/98	10/22/98
Depth	6-8'	20-22'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	24.7	10.6
Cobalt	10.1 J	2.3 J

Station ID	CAA02-A2DPB03	
Sample ID	CAA02-A2-DPB03-03-1098	CAA02-A2-DPB03-09-1098
Sample Date	10/22/98	10/22/98
Depth	6-8'	18-20'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	17.4	9.3
Cobalt	5.3 J	2.5 J

Station ID	CAA02-A2TP04F	CAA02-A2TP04N
Sample ID	CAA02-A2-TP04-F-1199	CAA02-A2-TP04-N-1199
Sample Date	11/12/99	11/12/99
Depth	2.5-3'	3.5-4'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	9.2	36.1
Chromium	15.1	43.3

Station ID	CAA02-A2HA02
Sample ID	CAA02-A2-HA02-01-1098
Sample Date	10/22/98
Depth	0.5-1'
Pesticide/PCBs (UG/KG)	
4,4'-DDE	120 J
Total Metals (MG/KG)	
Mercury	1

Station ID	CAA02-A2TP02F	CAA02-A2TP02N
Sample ID	CAA02-A2-TP02-F-1199	CAA02-A2-TP02-N-1199
Sample Date	11/12/99	11/12/99
Depth	3.5-4'	6-7'
Organic Compounds (UK/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Aluminum	6,160 L	13,700 L
Cadmium	12.3	0.16 U
Chromium	94.5	60.3
Cobalt	3.4 J	6.6 J
Copper	318	137 J
Iron	21,100 L	38,400 L
Thallium	0.64 B	0.84 L

Station ID	CAA02-A2DPB04	
Sample ID	CAA02-A2-DPB04-03-1098	CAA02-A2-DPB04-09-1098
Sample Date	10/23/98	10/23/98
Depth	6-8'	18-20'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	2.7	7.2
Iron	11,000	45,300

Station ID	CAA02-A2TP01F	CAA02-A2TP01N
Sample ID	CAA02-A2-TP01-F-1199*	CAA02-A2-TP01-N-1199
Sample Date	11/12/99	11/12/99
Depth	3.5-4'	4.8-5.4'
Pesticide/PCBs (UG/KG)		
Aroclor-1260	310	No Detections
Total Metals (MG/KG)		
Arsenic	5	9.4
Chromium	37.5	23.3
Iron	37,500 L	20,700 L

Station ID	CAA02-A2DPB01	
Sample ID	CAA02-A2-DPB01-03-1098	CAA02-A2-DPB01-15-1098
Sample Date	10/22/98	10/22/98
Depth	6-8'	30-32'
Organic Compounds (UG/KG)	No Exceedances	No Exceedances
Total Metals (MG/KG)		
Arsenic	7.6	9.2
Cobalt	1.7 U	5.5 J
Vanadium	54.4	14.6

Legend

- Soil Sample Location
- Test Pit Locations
- Study Area Boundary
- CAX Boundary / Fenceline

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, Res & Ind RSLs
- Exceeds BKG, ECO, Res & Ind RSLs

Samples collected at a depth greater than 2 feet below ground surface were not included in the ecological risk screening.
[1]Adjusted June 2011 RSL
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- - No value available
B - Analyte not detected above the level reported in blanks

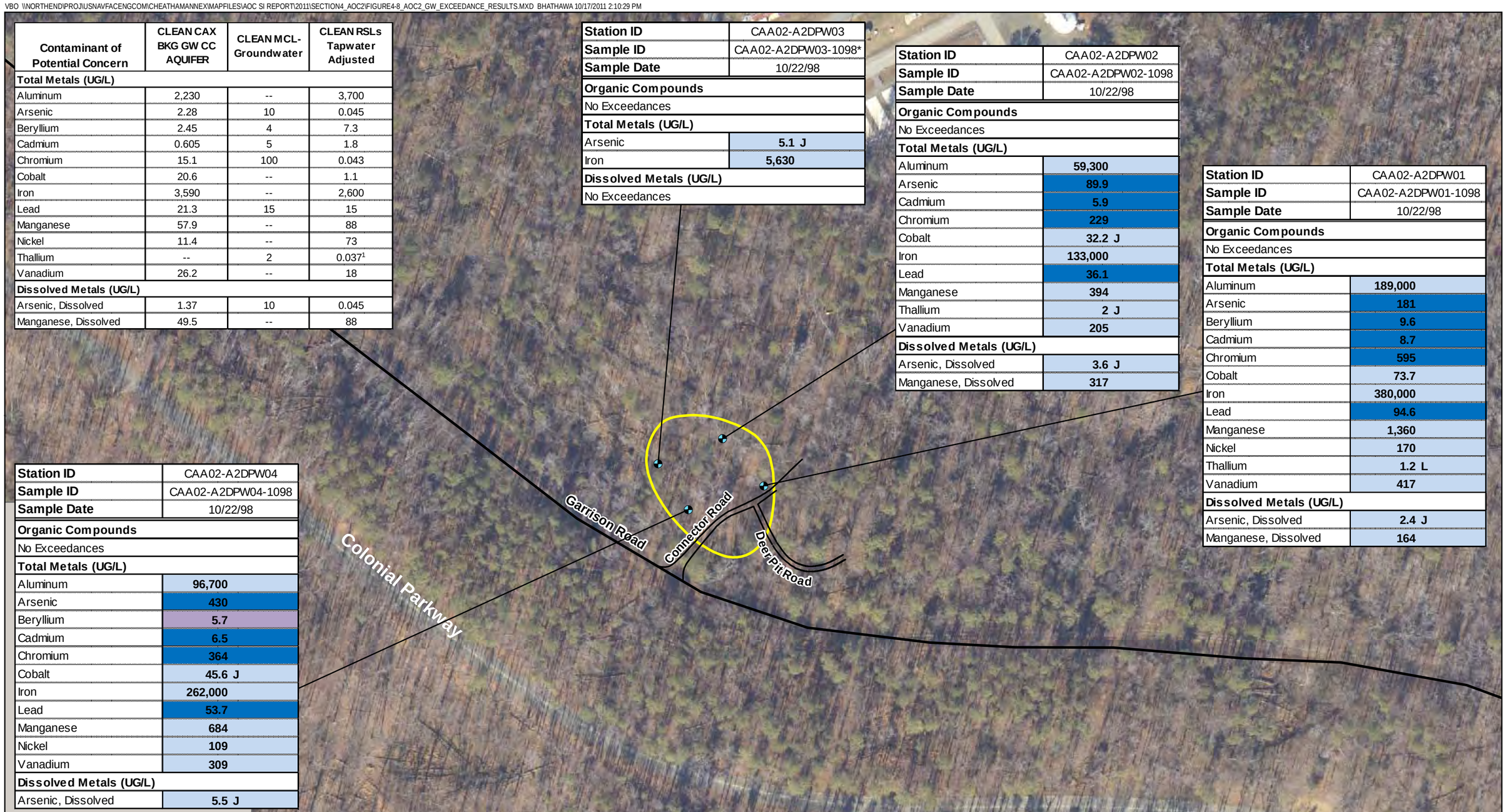
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N
W E
S

0 150 300
Feet

Figure 4-7
AOC 2 Subsurface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL



Contaminant of Potential Concern	CLEAN CAX BKG GW CC AQUIFER	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Total Metals (UG/L)			
Aluminum	2,230	--	3,700
Arsenic	2.28	10	0.045
Beryllium	2.45	4	7.3
Cadmium	0.605	5	1.8
Chromium	15.1	100	0.043
Cobalt	20.6	--	1.1
Iron	3,590	--	2,600
Lead	21.3	15	15
Manganese	57.9	--	88
Nickel	11.4	--	73
Thallium	--	2	0.037[1]
Vanadium	26.2	--	18
Dissolved Metals (UG/L)			
Arsenic, Dissolved	1.37	10	0.045
Manganese, Dissolved	49.5	--	88

Station ID	CAA02-A2DPW03
Sample ID	CAA02-A2DPW03-1098*
Sample Date	10/22/98
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Arsenic	5.1 J
Iron	5,630
Dissolved Metals (UG/L)	
No Exceedances	

Station ID	CAA02-A2DPW02
Sample ID	CAA02-A2DPW02-1098
Sample Date	10/22/98
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	59,300
Arsenic	89.9
Cadmium	5.9
Chromium	229
Cobalt	32.2 J
Iron	133,000
Lead	36.1
Manganese	394
Thallium	2 J
Vanadium	205
Dissolved Metals (UG/L)	
Arsenic, Dissolved	3.6 J
Manganese, Dissolved	317

Station ID	CAA02-A2DPW01
Sample ID	CAA02-A2DPW01-1098
Sample Date	10/22/98
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	189,000
Arsenic	181
Beryllium	9.6
Cadmium	8.7
Chromium	595
Cobalt	73.7
Iron	380,000
Lead	94.6
Manganese	1,360
Nickel	170
Thallium	1.2 L
Vanadium	417
Dissolved Metals (UG/L)	
Arsenic, Dissolved	2.4 J
Manganese, Dissolved	164

Station ID	CAA02-A2DPW04
Sample ID	CAA02-A2DPW04-1098
Sample Date	10/22/98
Organic Compounds	
No Exceedances	
Total Metals (UG/L)	
Aluminum	96,700
Arsenic	430
Beryllium	5.7
Cadmium	6.5
Chromium	364
Cobalt	45.6 J
Iron	262,000
Lead	53.7
Manganese	684
Nickel	109
Vanadium	309
Dissolved Metals (UG/L)	
Arsenic, Dissolved	5.5 J

Legend

- Monitoring Wells
- Study Area Boundary
- CAX Boundary / Fenceline

Notes:

Exceeds BKG and Tapwater RSL
Exceeds BKG and MCL
Exceeds BKG, Tapwater RSL, and MCL

[1]Adjusted June 2011 Tapwater RSL value
* - Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

N
W E
S

0 150 300
Feet

Figure 4-8
AOC 2 Groundwater Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

SECTION 5

AOC 6—Penniman AOC

This section presents an evaluation of the results from the SI performed at AOC 6. The section includes a summary of the investigations conducted at the site, the CSM, and the release assessment decision analysis.

5.1 History of Investigation

The following investigation was previously conducted and documented at AOC 6:

- Final Site Inspection Narrative Report, Penniman Shell Loading Plant, Williamsburg, Virginia (Weston, 1999a)

5.2 Conceptual Site Model

The CSM for AOC 6 is based on data collected as part of previous investigations and the SI. The CSM interprets the physical characteristics, the distribution of contamination and potential contaminant source, potential migration pathways, and the potential exposure and receptor pathways. The CSMs for AOC 6 are shown in **Figures 5-1** and **5-2**.

5.2.1 Site History and Potential Sources of Release

AOC 6 is comprised of five non-contiguous subareas, each less than 1 acre, related to the former PSLP. The PSLP was an explosives manufacturing facility operated by DuPont during WWI on what is now CAX and adjacent properties. This facility operated as a trinitrotoluene (TNT) manufacturing plant beginning in approximately 1916, and subsequently began loading artillery shells for the war effort in 1918. Between 1918 and 1925, this facility was demolished and the site reverted to farmland. The Navy established CAX on a portion of this property in 1942 (Weston, 1999a).

The five AOC 6 subareas (**Figure 5-3**), as defined in the CAX FFA (Navy, 2005), are as follows:

- **1918 Drum Storage—**Identified by the USEPA from a 1918 aerial photograph. This subarea was used for the storage of wooden barrels and/or 55-gallon drums when the shell loading facility was active (ATSDR, 2004). Currently, the area is developed and consists mostly of open maintained grassy areas and a parking lot.
- **Ammonia Settling Pits—**This wooded subarea is situated near the banks of Penniman Lake and consists of earthen ammonia settling pits that were part of a former shell loading area located on CAX. Wastewater from an ammonia finishing building was discharged through these settling pits.
- **TNT Graining House Sump—**This wooded subarea is situated near the banks of Penniman Lake and consists of a concrete-lined, open top pit believed to be the sump pit for the TNT graining house in the former shell loading area. For this SI, discussion of this subarea will be included with discussions of the TNT Catch Box Ruins based on their close geographical proximity.
- **TNT Catch Box Ruins—**This wooded subarea is situated near the banks of Penniman Lake and consists of an earthen, brick-lined depression located immediately adjacent to the TNT graining house in the former shell loading area. This area was used to separate TNT particles from wastewater. For this SI, discussion of this subarea will be included with discussions of the TNT Graining House Sump based on their close geographical proximity.
- **Waste Slag Material—**This subarea is comprised of a pile of metallic slag material that was identified and sampled during a 1999 SI (Weston, 1999a). The waste source pile was defined as 25 feet long by 10 feet long and located in the southern portion of the base.

1999 Site Inspection

In January 1999, soil, sediment, and/or surface water samples were collected from the 1918 Drum Storage, the Ammonia Settling Pits, and the TNT Graining House Sump and Catch Box Ruins subareas to assess potential

sources of contamination associated with the Penniman Facility and to support hazard ranking system (HRS) evaluations. In addition, a sample of the metallic slag material was collected from the Waste Slag Material subarea. All samples were analyzed for VOCs, SVOCs, pesticides, PCBs, nitramines/nitroaromatics, and inorganics. Analytical results indicated the presence of arsenic within the 1918 Drum Storage, the Ammonia Settling Pits and TNT Graining House subareas at concentrations exceeding the April 1999 Residential soil risk-based concentrations (RBC) (**Appendix G**; **Tables G-15** through **G-17**).

2008 Site Inspection Activities

AOC 6 investigation activities included surface soil, subsurface soil, and groundwater sampling from the 1918 Drum Storage, Ammonia Settling Pits, and TNT Graining House Sump and TNT Catch Box Ruins subareas. In addition, sediment (surface and subsurface) and surface water samples were collected from Penniman Lake near the TNT Graining House Sump and Catch Box Ruins subareas. An explanation for each activity and methods of sample collection are documented in Section 2.

No samples were collected from the Waste Slag Material subarea because at the time of the 2008 SI field activities, this subarea was considered to be associated with former railroad activities; therefore, not considered a CERCLA-related release. Following the completion of the 2008 SI field activities, the Navy and USEPA have agreed to address the Waste Slag Material subarea, the results of which will be presented in a separate report.

2010 Geophysical Survey

Following the 2008 SI field activities at AOC 6, a geophysical survey was conducted in April 2010 around the Ammonia Settling Pits, TNT Graining House Sump and TNT Catch Box Ruins subareas. An explanation of the 2010 geophysical survey is documented in Section 2. The results of the survey (**Appendix I**) indicated there is no evidence of underground piping at any of the three subareas.

5.2.2 Physical Setting

Topography and Surface Water

The 1918 Drum Storage subarea is generally topographically flat and contains no wetlands or water bodies; there are no nearby water bodies immediately downgradient of this subarea (**Figure 5-4**). However, the northwest finger of Penniman Lake is located approximately 400 feet to the southeast. The topography in the vicinity of the Ammonia Settling Pits, TNT Graining House Sump, and TNT Catch Box Ruins subareas are gently undulating with a somewhat abrupt topographic descent along the shoreline of Penniman Lake. Runoff from AOC 6 flows primarily east toward Penniman Lake and southeast toward King Creek (**Figure 5-5**).

Hydrogeology

In general, soil in the 1918 Drum Storage subarea are predominantly olive brown silt and clay, with a pale yellow shell hash present between 8 and 9 feet bgs. In general, soil in the vicinity of the Ammonia Settling Pits and the TNT Graining House Sump and Catch Box Ruins subareas consist of brown silt and olive brown clay, underlain by yellow sand. Soil boring logs from the SI field activities present descriptions of the soil and general subsurface geology and are included as **Appendix C**.

The shallow aquifer underlying the four AOC 6 subareas is the Yorktown-Eastover aquifer. Groundwater was encountered from approximately 10 to 11 feet bgs at the 1918 Drum Storage subarea, and from approximately 8 to 11 feet bgs in the vicinity of the Ammonia Settling Pits, the TNT Graining House Sump, and TNT Catch Box Ruins subareas. In the 1918 Drum Storage subarea, groundwater is expected to flow southeast toward Penniman Lake, which is the nearest open-water body to this area. In the Ammonia Settling Pits subarea, groundwater is expected to flow northwest to northeast to the adjacent Penniman Lake; and in the TNT Graining House Sump and Catch Box Ruins subareas, groundwater is expected to flow east to the adjacent Penniman Lake and southeast toward King Creek.

Current and Future Land Use

AOC 6 is within the confines of CAX and access is restricted to the general public. Navy and DoD personnel do have access to the AOC 6 subareas. The 1918 Drum Storage subarea currently includes grassed areas, a paved

parking lot, and two office buildings. The Ammonia Settling Pits and the TNT Graining House Sump and TNT Catch Box Ruins subareas are currently used by Navy and DoD personnel for recreational activities, such as jogging, hunting, and fishing.

Future land use at AOC 6 is not expected to change and will likely continue as industrial (1918 Drum Storage subarea) and recreational (the Ammonia Settling Pits and TNT graining House Sump and Catch Box Ruins subareas) for the foreseeable future.

5.2.3 Distribution of Contamination

Data collected from the 1918 Drum Storage subarea, the Ammonia Settling Pits subarea, and the TNT Graining House Sump and Catch Box Ruins subareas during the 2008 SI field activities were evaluated as part of this SI report (**Figures 5-6** and **5-7**).

Historical soil (surface and subsurface), sediment, and surface water data was collected as part of the 1999 SI. However, because of the length of time between the collection of these historical samples and the samples collected during the 2008 SI field activities, these samples were not used in evaluating the distribution of contamination at AOC 6. In addition, no information regarding the validation of this data is available.

Tables 5-1 through **5-11** summarize all constituents detected in AOC 6 surface soil, subsurface soil, groundwater, surface water, surface sediment, and subsurface sediment samples collected during the 2008 SI field activities. All analytical data for the 2008 SI samples are provided in **Appendix H**.

1918 Drum Storage

Soil

Six surface soil (0-6 inches) and six subsurface soil (6-24 inches) samples (SS/SB14 through SS/SB19) were collected from the AOC 6 1918 Drum Storage subarea as part of the 2008 SI field activities (**Table 2-1**).

The soil sample locations were positioned to determine if a release from historical activities had occurred and to characterize potential migration pathways. Additionally, a soil sample was collected from a location expected to be upgradient from the 1918 Drum Storage subarea, in an area assumed to be unaffected by site conditions.

Surface and subsurface soil samples were submitted for analysis of inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerine, and nitroguanadine), TOC, and pH. In addition, as requested by USEPA, surface and subsurface soil samples were submitted for analysis of SVOCs. Since the analytical results from the 1999 SI identified inorganics and explosives as constituents that exceeded the RBCs, soil samples were not analyzed for VOCs, pesticides, and PCBs. The soil analytical results are listed in **Tables 5-1 and 5-2**, and the exceedances are shown on **Figures 5-8 and 5-9**.

SVOCs and Explosives

- No SVOCs or explosives were detected in surface and subsurface soil samples (**Tables 5-1** and **5-2**).

Inorganic Constituents

- Two inorganics (aluminum and lead) exceeded at least one screening criterion in surface soil (**Figure 5-8**).
- Aluminum exceeded screening criteria in one surface soil sample (SS19) at a concentration of 12,800 mg/kg, located outside the 1918 Drum Storage subarea. However, this concentration of aluminum was slightly above its base background UTL (12,200 mg/kg) and is likely attributable to background. Lead slightly exceeded the ecological screening value (120 mg/kg) in one surface soil sample (SS15) at a concentration of 128 mg/kg, located outside the 1918 Drum Storage subarea.
- Two inorganics, aluminum and thallium, exceeded at least one screening criterion in subsurface soil (**Figure 5-9**).
- Aluminum exceeded screening criteria in subsurface soil sample SB16 at a concentration of 13,200 mg/kg, located in the northeast corner of the 1918 Drum Storage subarea. However, this concentration of aluminum

was slightly above its base background UTL (13,000 mg/kg) and is likely attributable to natural background conditions.

- Thallium exceeded the adjusted residential RSL (0.078 mg/kg) in subsurface soil sample SB16 at a concentration of 0.084 mg/kg, but did not exceed the unadjusted residential RSL (0.78 mg/kg).

Groundwater

Groundwater samples were collected from three DPT locations (DW09 through DW11) during the 2008 SI field activities (**Table 2-1**). The groundwater samples were collected from within the 1918 Drum Storage subarea (DW10) and in the upgradient (in an area assumed to be unaffected by site conditions) and downgradient directions (DW11 and DW09, respectively). The groundwater samples were positioned to determine if a release had occurred and to characterize potential migration pathways.

Groundwater samples were submitted for analysis of inorganics (total and dissolved), cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerine, and nitroguanadine). In addition, as requested by the USEPA, groundwater samples were submitted for analysis of SVOCs. Since the soil analytical results from the 1999 SI identified inorganics and explosives as constituents that exceeded the RBCs, groundwater samples were not analyzed for VOCs, pesticides, and PCBs. The groundwater analytical results are listed in **Table 5-3** and the exceedances are shown on **Figure 5-10**.

SVOCs and Explosives

- No SVOCs or explosives were detected in groundwater samples (**Table 5-3** and **Figure 5-10**).

Inorganic Constituents

Sixteen total inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, thallium, vanadium, and zinc) and one dissolved inorganic (aluminum) exceeded at least one screening criterion in groundwater (**Table 5-3** and **Figure 5-10**).

Dissolved inorganics data are likely more representative of inorganic concentrations migrating in groundwater, since the DPT method generally results in higher total inorganic concentrations from the higher turbidity.

- Several total inorganics were detected all three groundwater samples. However, only aluminum and thallium were detected in the dissolved fraction, and the total inorganic detections are likely the result of the higher turbidity. Dissolved aluminum was detected at a maximum concentration of 385 µg/L (DW09), slightly above its base background UTL of 100 µg/L, and is likely attributable to background.

Ammonia Settling Pits

Soil

Five surface soil (0-6 inches) and five subsurface soil (6-24 inches) samples (SS/SB05 through SS/SB12) were collected from the AOC 6 Ammonia Settling Pits subarea as part of the 2008 SI field activities (**Table 2-1**). The soil sample locations were determined to accommodate site-specific topographic and hydrologic conditions, with a bias toward locations with the greatest potential for contamination as well as thorough spatial coverage. Additionally, a soil sample was collected from a location expected to be upgradient from the Ammonia Settling Pits subareas, in an area assumed to be unaffected by site conditions.

Surface and subsurface soil samples were submitted for analysis of inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerine, and nitroguanadine), TOC, and pH. In addition, as requested by USEPA, surface and subsurface soil samples were submitted for analysis of SVOCs. Since the analytical results from the 1999 SI identified inorganics and explosives as constituents that exceeded the RBCs, soil samples were not analyzed for VOCs, pesticides, and PCBs. The soil analytical results are listed in **Tables 5-4 and 5-5**, and the exceedances are shown on **Figures 5-11 and 5-12**.

SVOCs and Explosives

Three SVOCs (benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene) and one explosive (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine [HMX]) exceeded at least one screening criterion in surface soil (**Figure 5-11**). No SVOCs or explosives exceeded any screening criterion in subsurface soil (**Table 5-5**).

- Benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene only exceeded screening criteria in two surface soil samples (SS05 and SS06). The maximum concentrations of these constituents were 230J, 270J, and 230J µg/kg, respectively, and were detected in surface soil sample SS05, located within the footprint of the former Ammonia Finishing building. These concentrations may be indicative of a release from the former Ammonia Finishing building.
- HMX exceeded the ecological screening value (10,000 µg/kg) in one surface soil sample (SS10) at a concentration of 20,000 µg/kg (**Figure 5-11**). Since this subarea was part of the PSLP, this exceedance is likely attributable to a historical release. HMX, however, was not detected in the co-located subsurface soil (SB10) or groundwater (DW03) samples.

Inorganic Constituents

One inorganic, mercury, exceeded at least one screening criterion in surface soil samples (**Figure 5-11**).

- Mercury exceeded the ecological screening value (0.10 mg/kg) in one surface soil sample (SS06) at a concentration of 0.18 mg/kg, located north of the former ammonia finishing building. However, mercury was slightly above its base background UTL (0.111 mg/kg) and is likely attributable to natural background conditions.
- One inorganic, aluminum, exceeded at least one screening criterion in subsurface soil samples (**Figure 5-12**).
- Aluminum exceeded screening criteria in one surface soil sample (SB10) with a concentration of 15,900 mg/kg, located east of the former ammonia finishing building. However, aluminum was slightly above its base background UTL (13,000 mg/kg) and is likely attributable to natural background conditions.

Groundwater

Groundwater samples were collected from three DPT locations (DW02 through DW04) during the 2008 SI field activities (**Table 2-1**). One sample (DW04) was collected from a location expected to be upgradient from the Ammonia Settling Pits subarea, in an area assumed to be unaffected by site conditions. The remaining two locations were determined to accommodate site-specific topographic and hydrologic conditions, with a bias toward locations with the greatest potential for contamination as well as thorough spatial coverage.

Groundwater samples were submitted for analysis of inorganics (total and dissolved), cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerine, and nitroguanadine). In addition, as requested by USEPA, groundwater samples were submitted for analysis of SVOCs. Since the soil analytical results from the 1999 SI identified inorganics and explosives as constituents that exceeded the RBCs, groundwater samples were not analyzed for VOCs, pesticides, and PCB. The groundwater analytical results are listed in **Table 5-6** and the exceedances are shown on **Figure 5-13**.

SVOCs and Explosives

- No SVOCs or explosives were detected in groundwater samples (**Table 5-6**).

Inorganic Constituents

Eleven total inorganics (aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, nickel, vanadium, and zinc) and four dissolved inorganics (arsenic, cobalt, iron, and manganese) exceeded at least one screening criterion in groundwater (**Figure 5-13**).

Dissolved inorganics data are likely more representative of inorganic concentrations migrating in groundwater, since the DPT method generally results in higher total inorganic concentrations from the higher turbidity.

- Dissolved arsenic, cobalt, iron, and manganese were detected at maximum concentrations of 18.4, 25.2J, 51,400, and 3,170 µg/L, above their respective background UTLs of 1.37, 0.7, 275, and 49.5 µg/L. The maximum dissolved arsenic concentration (DW03) exceeded the adjusted tap water RSL (0.045 µg/L) and the MCL (10 µg/L); the maximum dissolved cobalt concentration (DW04) exceeded the adjusted tap water RSL (1.1 µg/L) and the ecological screening value (23.0 µg/L); the maximum dissolved iron concentration (DW03) exceeded the adjusted tap water RSL (2,600 µg/L) and the ecological screening value (1,000 µg/L); and the maximum dissolved manganese concentration (DW04) exceeded the adjusted tap water RSL (88 µg/L) and the ecological screening value (120 µg/L).

TNT Graining House Sump and TNT Catch Box Ruins

Soil

Seven surface soil (0-6 inches) and seven subsurface soil (6-24 inches) samples (SS/SB01 through SS/SB04, SS/SB07, SS/SB08 and SS/SB13) were collected from the AOC 6 TNT Graining House Sump and Catch Box Ruins subareas as part of the 2008 SI field activities (**Table 2-1**). The soil sample locations were determined to accommodate site-specific topographic and hydrologic conditions, with a bias toward locations with the greatest potential for contamination as well as thorough spatial coverage. Additionally, a soil sample was collected from a location expected to be upgradient from the TNT subareas, in an area assumed to be unaffected by site conditions.

Surface and subsurface soil samples were submitted for analysis of inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerine, and nitroguanadine), TOC, and pH. In addition, as requested by USEPA, surface and subsurface soil samples were submitted for analysis of SVOCs. Since the analytical results from the 1999 SI identified inorganics and explosives as constituents that exceeded the RBCs, soil samples were not analyzed for VOCs, pesticides, and PCBs. The soil analytical results are listed in **Tables 5-7 and 5-8**, and the exceedances are shown on **Figures 5-14 and 5-15**.

SVOCs and Explosives

One SVOC (2,4-dinitrotoluene) and six explosives (1,3-dinitrobenzene, 2,4,6-trinitrotoluene [2,4,6-TNT], 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, and 4-amino-2,6-dinitrotoluene) exceeded at least one screening criterion in surface soil samples (**Figure 5-14**) and are likely attributable to a historical release.

- 2,4-dinitrotoluene exceeded both the residential RSL (1,600 µg/kg) and the industrial RSL (5,500 µg/kg) in one surface soil sample (SS01) at a concentration of 6,300 µg/kg, located just outside of the Catch Box Ruins.
- The most frequently detected explosive, 2,4,6-TNT, was detected at concentrations exceeding screening criteria in the four surface soil samples located in the immediate vicinity of the TNT Graining House and the Catch Box Ruins (SS01, SS02, SS03, and SS13) with a maximum concentration of 4,500,000 µg/kg.

One SVOC (2,4,-dinitrotoluene) and three explosives (1,3-dinitrobenzene, 2,4,6-TNT, and 4-amino-2,6-dinitrotoluene) exceeded at least one screening criterion in subsurface soil samples (**Figure 5-15**) and are likely associated with a historical release.

- 2,4-dinitrotoluene exceeded screening criteria in one subsurface soil sample (SS01) at a concentration of 12,000 µg/kg, located just outside of the Catch Box Ruins.
- The most frequently detected explosive, 2,4,6-TNT, was detected at concentrations exceeding screening criteria in three subsurface soil samples located in the immediate vicinity of the TNT Graining House and the Catch Box Ruins (SS01, SS02, and SS13) at a maximum concentration of 2,700,000 µg/kg.

Inorganic Constituents

Ten inorganics (aluminum, arsenic, chromium, iron, lead, mercury, selenium, thallium, vanadium, and zinc) exceeded at least one screening criterion in surface soil samples (**Figure 5-14**). Seven inorganics (aluminum, arsenic, chromium, iron, selenium, thallium, and vanadium) exceeded at least one screening criterion in subsurface soil (**Figure 5-15**).

- Ten and nine inorganics exceeding their respective screening criterion were detected in surface soil samples SS03 and SS01, respectively. In addition, the maximum inorganic concentrations in subsurface soil samples were collected from the co-located subsurface soil samples SB01 and SB03. SS/SB01 and SS/SB03 are located in the immediate vicinity of the TNT Graining House and Catch Box Ruins.

Groundwater

Groundwater samples were collected from four DPT locations (DW01 and DW06 through DW08) during the 2008 SI field activities (**Table 2-1**). The groundwater samples were collected in the immediate vicinity of the TNT Graining House and Catch Box Ruins (DW06 and DW07) and in the upgradient (in an area assumed to be unaffected by site conditions) and downgradient direction (DW01 and DW08, respectively). The groundwater samples were positioned in areas with the highest potential for contamination.

Groundwater samples were submitted for analysis of inorganics (total and dissolved), cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerine, and nitroguanadine). In addition, as requested by USEPA, groundwater samples were submitted for analysis of SVOCs. Since the soil analytical results from the 1999 SI identified inorganics and explosives as constituents that exceeded the RBCs, groundwater samples were not analyzed for VOCs, pesticides, and PCBs. The groundwater analytical results are listed in **Table 5-9** and the exceedances are shown on **Figure 5-16**.

SVOCs and Explosives

No SVOCs or explosives were detected in groundwater samples (**Table 5-9**).

Inorganic Constituents

- Thirteen total inorganics (aluminum, arsenic, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc) and ten dissolved inorganics (aluminum, arsenic, chromium, cobalt, copper, iron, lead, manganese, silver, and thallium) exceeded at least one screening criterion in groundwater (**Figure 5-16**). All 13 total inorganics and all ten dissolved inorganics exceeding their respective screening criterion were detected in only one groundwater sample (DW07), located in the immediate vicinity of the Catch Box Ruins.

Penniman Lake Surface Water and Sediment

Surface Water

Two surface water samples were collected from the edge of Penniman Lake (SW01 and SW02) during the 2008 field activities (**Table 2-1**). Sample locations were positioned to determine if a release occurred from the Ammonia Settling Pits subarea and the TNT Graining House Sump and Catch Box Ruins subareas.

Surface water was analyzed for SVOCs, inorganics (total and dissolved), cyanide (total and dissolved), explosives (including nitroglycerine and nitroguandine), and hardness. The surface water analytical results are listed in **Table 5-10** and the exceedances are shown on **Figure 5-17**.

SVOCs and Explosives

No SVOCs or explosives were detected in surface water samples above their respective screening criterion (**Table 5-10**).

Inorganic Constituents

One inorganic (total thallium) exceeded the human health screening value (0.37 µg/L) in one surface water sample, and one inorganic, barium (total and dissolved), exceeded the ecological screening value of 4 µg/L in both surface water samples (**Figure 5-17**). Total barium was detected in SW01 at a concentration of 19.6J µg/L and in SW02 at a concentration of 19.8J µg/L. Dissolved barium was detected in SW01 at a concentration of 17.8J µg/L and in SW02 at a concentration of 15.9J µg/L.

Sediment

Two surface sediment and subsurface sediment samples were collected from Penniman Lake (SD/SSD01 and SD/SSD02) during the 2008 field activities (**Table 2-1**). Surface sediment samples were collected from 0-4 inches bgs and subsurface sediment samples were collected from 4-8 inches bgs. Sample locations were co-located with surface water samples and were positioned to determine if a release occurred from the Ammonia Settling Pits subarea and the TNT Graining House Sump and Catch Box Ruins subareas.

Sediment samples were analyzed for SVOCs, inorganics, cyanide, explosives (including nitroglycerine and nitroguandine), AVS/SEM, TOC, pH, and grain size. The sediment analytical results are listed in **Table 5-11** and the exceedances are shown on **Figure 5-17**.

SVOCs and Explosives

One SVOC, 2,6-dinitrotoluene, exceeded the Equilibrium Partitioning (EqP) value of 187 µg/kg in one subsurface sediment sample (SD02, near the Ammonia Settling Pits) at a concentration of 260 µg/kg. However, since the mean HQ for 2,6-dinitrotoluene was less than one, this constituent was not identified as a refined COPC during the ecological risk screening. No other SVOCs or explosives exceeded their respective screening criterion in surface and subsurface sediment samples.

Inorganic Constituents

Two inorganics (arsenic and chromium) exceeded at least one screening criterion in the surface and subsurface sediment sample collected adjacent to the Catch Box Ruins and in the surface sediment sample collected adjacent to the Ammonia Settling Pits subarea **Figure 5-17***)*.

- Arsenic was detected at a maximum concentration of 12.1J mg/kg in surface sediment sample SD01, located near the TNT Graining House and Catch Box Ruins subareas. This concentration exceeded the adjusted residential RSL of 3.9 mg/kg and the ecological screening value of 9.79 mg/kg. Site-specific sediment background values were not established.
- Chromium was detected at a maximum concentration of 7.6J mg/kg in subsurface sediment sample SSD02, located near the Ammonia Settling Pits subarea. This concentration exceeded the adjusted residential RSL of 2.9 mg/kg. Site specific sediment background values were not established.

5.2.4 Potential Exposure and Receptor Pathways

Potential receptors at AOC 6 include: current/future recreational users/visitors, trespassers, maintenance workers, and industrial workers; future residents and construction workers; and lower trophic level terrestrial receptors (plants and soil invertebrates) and lower trophic level aquatic receptors (like aquatic plants, aquatic and benthic invertebrates, fish, amphibians, and reptiles associated with Penniman Lake).

Human Health Risk Evaluation

The HHRS for AOC 6 is presented in **Appendix A**. An overview of the various potential receptors and exposure pathways for the site is presented in the human health CSM, **Figure A-1** of **Appendix A**. The results of the evaluation for AOC 6 are summarized as follows.

1918 Drum Storage[9]

Surface Soil

- The risk-based screening/risk ratio evaluation for surface soil at the AOC 6 1918 Drum Storage subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.2** and **2.2a**.
- In Step 1, one constituent was detected in surface soil samples at concentrations above background (for metals) and the human health screening levels, and was identified as a COPC—aluminum.

[9]Since the proposed recommendation for the 1918 Drum Storage HH subarea is NFA, its HH screen was updated from the November 2010 RSL values (available when the HH screen was first prepared) to the June 2011 RSL values (USEPA, 2011) to determine if NFA was still appropriate.

- In Step 2, based on the maximum detected concentration for the COPC, a cumulative target organ HIs calculated for the COPC was 0.2; this HI value was less than the cumulative target organ HI risk-ratio screening benchmark of 0.5. No constituents were identified as COPCs.

Exposure to surface soil at the AOC 6 1918 Drum Storage subarea would not be expected to result in any unacceptable human health risks.

Subsurface Soil

- The risk-based screening for subsurface soil at the AOC 6 1918 Drum Storage subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.5** and **2.5a**.
- In Step 1, two constituents were detected in surface soil samples at concentrations above background (for metals) and the human health screening levels, and were identified as a COPCs—aluminum and thallium.
- In Step 2, based on the maximum detected concentration, a cumulative target organ HI of 0.2 was calculated, which is less than the cumulative target organ HI risk-ratio screening benchmark of 0.5. No constituents were identified as COPCs.

Exposure to subsurface soil at the AOC 6 1918 Drum Storage subarea would not be expected to result in unacceptable human health risks.

Groundwater

- The risk-based screening for groundwater at the AOC 6 1918 Drum Storage subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.8** and **2.8a**.
- In Step 1, twelve constituents were detected in groundwater samples at concentrations above background (for metals) and the human health screening levels, and were selected as COPCs—aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, thallium, and vanadium. The maximum lead concentration in AOC 6 1918 Drum Storage subarea groundwater is 50 µg/L, which is greater than the lead screening level. The average lead concentration is 25 µg/L, which is also above the screening level. Therefore, lead is considered to be present at a concentration of potential concern, and lead was retained as a COPC.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 9×10^{-3} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.1 to 4; five of the seven HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were identified as COPCs and include aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, manganese, and vanadium.
- Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at the AOC 6 1918 Drum Storage subarea may result in unacceptable human health risks associated with aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, thallium, and vanadium.

Ammonia Settling Pits

Surface Soil

The risk-based screening for surface soil at the AOC 6 Ammonia Settling Pits subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.1** and **2.1a**.

- In Step 1, three constituents were detected in surface soil samples above human health screening levels, and were identified as COPCs—benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene.

- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-5} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs were not calculated, as all the COPCs are carcinogenic. No constituents were identified as COPCs.

Exposure to surface soil at the AOC 6 Ammonia Settling Pits subarea would not be expected to result in any unacceptable human health risks.

Subsurface Soil

- The risk-based screening for subsurface soil at the AOC 6 Ammonia Settling Pits subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.4** and **2.4a**.
- In Step 1, one constituent was detected in subsurface soil samples above background (for metals) and the human health screening levels, and was identified as a COPC—aluminum.
- In Step 2, based on the maximum detected concentration for aluminum, a cumulative target organ HI of 0.2 was calculated; this value is less than the benchmark of 0.5. Therefore, no COPCs were identified.

Exposure to subsurface soil at the AOC 6 Ammonia Settling Pits subarea would not be expected to result in any unacceptable human health risks.

Groundwater

- The risk-based screening for groundwater at the AOC 6 Ammonia Settling Pits subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.7** and **2.7a**.
- In Step 1, eight constituents were detected in groundwater samples at concentrations above background (for metals) and the human health screening levels, and were identified as COPCs—aluminum, arsenic, chromium, cobalt, iron, lead, manganese, and vanadium. The maximum lead concentration in the AOC 6 Ammonia Settling Pits subarea groundwater is 22.3 µg/L, which is greater than the lead screening level. The average lead concentration is 11 µg/L, which is less than the screening level. Therefore, lead is not considered to be present at a concentration of potential concern, and lead was not retained as a COPC. Also, lead was not detected in the dissolved phase.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-3} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.3 to 5; three of the five HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were selected as COPCs and include aluminum, arsenic, chromium, cobalt, iron, and manganese.
- Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at the AOC 6 Ammonia Settling Pits subarea may result in unacceptable human health risks associated with aluminum, arsenic, chromium, cobalt, iron, and manganese.

Surface Water

- The risk-based screening for surface water at the AOC 6 Ammonia Settling Pits subarea is provided in **Appendix A**, **Attachment A.3**, **Table 2.10**.
- In Step 1, no constituents were detected in surface water samples at concentrations above the human health screening levels and no COPCs were identified. One detected SVOC (di-n-octylphthalate) does not have any available screening criteria; potential risks associated with this constituent could not be evaluated.

Exposure to surface water at the AOC 6 Ammonia Settling Pits subarea would not be expected to result in any unacceptable human health risks.

Sediment

The risk-based screening/ for sediment at the AOC 6 Ammonia Settling Pits subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.12** through **2.13a**. No constituents were detected in surface sediment (0 to 4 inches) samples at a concentration above the human health screening levels, and no COPCs were identified.

- In Step 1, two constituents were detected in subsurface sediment (4 to 8 inches) samples at a concentration above the human health screening levels, and were selected as COPCs—arsenic and chromium.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 4×10^{-6} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark. No constituents were identified as COPCs.

Exposure to surface and subsurface sediment at the AOC 6 Ammonia Settling Pits subarea would not be expected to result in any unacceptable human health risks.

TNT Graining House Sump and TNT Catch Box Ruins

Surface Soil

The risk-based screening for surface soil at the AOC 6 TNT Graining House subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.3** through **2.3b**.

- In Step 1, thirteen constituents were detected in surface soil samples at concentrations above background (for PAHs, explosives, and metals) and the human health screening levels, and were identified as COPCs—2,4-dinitrotoluene, 1,3-dinitrobenzene, 2,4,6-TNT, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, 4-amino-2,6-dinitrotoluene, aluminum, arsenic, chromium, iron, lead, and vanadium. The average lead concentration in surface soil is 119 mg/kg, which is less than the lead screening level. Therefore, lead is not considered to be present at a concentration of potential concern, and lead was eliminated as a COPC.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 4×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.1 to 0.7; one of five HI values was greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were identified as COPCs and include 2,4-dinitrotoluene, 2,4,6-TNT, 2-nitrotoluene, arsenic, chromium, and iron.
- In Step 3, based on the use of the 95 percent UCL for the EPCs, a cumulative cancer risk of 3×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. A cumulative target organ HI of 0.5 was calculated; this HI value did not exceed the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk were identified as COPCs and include 2,4-dinitrotoluene, 2,4,6-TNT, 2-nitrotoluene, arsenic, and chromium.

Exposure to surface soil at the AOC 6 TNT Graining House subarea may result in unacceptable human health risks associated with 2,4-dinitrotoluene, 2,4,6-TNT, 2-nitrotoluene, arsenic, and chromium. The primary contributors to the potential unacceptable carcinogenic risk are 2,4,6-TNT and chromium.

There were no residential or industrial soil RSL values for thallium when the HH risk screen was originally prepared, and thallium was not detected in the background data set. However, with the June 2011 RSL table update, which became available while the draft document was undergoing regulator review, RSLs have been established for thallium, so a comparison to these values was made[10]. Thallium was detected in one of the seven surface soil samples at a concentration of 0.18 mg/kg, qualified with a J data validation qualifier. This concentration exceeds the adjusted residential soil RSL of 0.078 mg/kg, but does not exceed the unadjusted

[10] The TNT Graining House Sump and TNT Catch Box Ruin HH risk screen was not re-run with the June 2011 RSLs; only a comparison of results against the new thallium RSLs was conducted.

residential soil RSL (0.78 mg/kg). This concentration does not exceed the adjusted industrial soil RSL of 1 mg/kg (or the unadjusted industrial soil RSL of 10 mg/kg).

Subsurface Soil

The risk-based screening for subsurface soil at the AOC 6 TNT Graining House subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.6** through **2.6b**.

- In Step 1, nine constituents were detected in subsurface soil samples at concentrations above background (for PAHs, explosives, and metals) and the human health screening levels, and were selected as COPCs—2,4-dinitrotoluene, 1,3-dinitrobenzene, 2,4,6-TNT, 4-amino-2,6-dinitrotoluene, aluminum, arsenic, chromium, iron, and vanadium.
- In Step 2, based on the maximum detected concentration for COPCs, a cancer risk of 3×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.1 to 0.6; one of five HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were selected as COPCs and include 2,4-dinitrotoluene, 2,4,6-TNT, arsenic, chromium, and iron.
- In Step 3, based on the use of the 95 percent UCL for the EPCs, a cumulative cancer risk of 2×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. The cumulative target organ HI calculated for the COPC was 0.4 no HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk were selected as COPCs and included 2,4-dinitrotoluene, 2,4,6-TNT, arsenic, and chromium.

Exposure to subsurface soil at the AOC 6 TNT Graining House subarea may result in unacceptable human health risks associated with 2,4-dinitrotoluene, 2,4,6-TNT, arsenic, and chromium. The potential unacceptable carcinogenic risk is primarily associated with 2,4,6-TNT and chromium.

There were no residential or industrial soil RSL values for thallium when the HH risk screen was originally prepared, and thallium was not detected in the background data set. However, with the June 2011 RSL table update, which became available while the draft document was undergoing regulator review, RSLs have been established for thallium, so a comparison to these values was made[11]. Thallium was detected in one of the seven subsurface soil samples at a concentration of 0.07 mg/kg, qualified with a J data validation qualifier. This concentration is below the adjusted residential soil RSL of 0.078 mg/kg and adjusted industrial soil RSL of 1 mg/kg.

Groundwater

The risk-based screening for groundwater at the AOC 6 TNT Graining House subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.9** and **2.9a**.

- In Step 1, nine constituents were detected in groundwater samples at concentrations above background (for inorganics) and the human health screening levels, and were selected as COPCs—aluminum, arsenic, beryllium, chromium, cobalt, iron, lead, manganese, and vanadium.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 7×10^{-3} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.9 to 9; all of the HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or the cumulative HI were selected as COPCs and include aluminum, arsenic, beryllium, chromium, cobalt, iron, manganese, and vanadium. The maximum lead concentration in the AOC 6 TNT Graining House subarea groundwater is 72 µg/L, and the average concentration is 37 µg/L, which are greater than the lead screening

[11] The TNT Graining House Sump and TNT Catch Box Ruin HH risk screen was not re-run with the June 2011 RSLs; only a comparison of results against the new thallium RSLs was conducted.

level. Therefore, lead is considered to be present at a concentration of potential concern, and lead was retained as a COPC.

- Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at the AOC 6 TNT Graining House subarea may result in unacceptable human health risks associated with aluminum, arsenic, beryllium, chromium, cobalt, iron, lead, manganese, and vanadium.

Surface Water

The risk-based screening for surface water at the AOC 6 TNT Graining House subarea is provided in **Appendix A**, **Attachment A.3**, **Table 2.11**. No constituents were detected in surface water samples at concentrations above the human health screening levels, and no COPCs were identified.

Exposure to surface water at the AOC 6 TNT Graining House subarea would not be expected to result in any unacceptable human health risks.

Sediment

The risk-based screening for sediment at the AOC 6 TNT Graining House subarea is provided in **Appendix A**, **Attachment A.3**, **Tables 2.14** through **2.15a**.

- In Step 1, two constituents were detected in surface sediment (0 to 4 inches) samples at concentrations above the human health screening levels, and were selected as COPCs—arsenic and chromium. One detected SVOC (di-n-octylphthalate) does not have any available screening criteria; potential risks associated with this constituent could not be evaluated. In addition, one constituent was detected in subsurface sediment (4 to 8 inches) samples at a concentration above the human health screening levels, and was selected as a COPC—arsenic.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 5×10^{-6} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark. No constituents were selected as COPCs. In addition, based on the use the maximum detected concentration for arsenic, a cancer risk of 2×10^{-6} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark. Arsenic was not selected as a COPC.

Exposure to surface and subsurface sediment at the AOC 6 TNT Graining House subarea would not be expected to result in any unacceptable human health risks.

There was no tap water RSL value for thallium when the HH risk screen was originally prepared, and thallium was not detected in the background data set. However, with the June 2011 RSL table update, which became available while the draft document was undergoing regulator review, RSLs have been established for thallium, so a comparison to these values was made[12]. Thallium was detected in the one surface water sample at a concentration of 1.7 J μg/L. This concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 μg/L), but does not exceed the unadjusted screening level (tap water RSL times ten, 3.7 μg/L).

Ecological Risk Evaluation

The ecological screening for surface soil, subsurface soil, and groundwater at AOC 6 was conducted for the following subareas:

- The 1918 Drum Storage subarea
- The Ammonia Settling Pits subarea
- The TNT Graining House Sump and Catch Box Ruins subareas

[12] The TNT Graining House Sump and TNT Catch Box Ruin HH risk screen was not re-run with the June 2011 RSLs; only a comparison of results against the new thallium RSLs was conducted.

In addition, an ecological screening for Penniman Lake sediment and surface water adjacent to AOC 6 was conducted. No spatial groupings were used for surface water and sediment. The results of the risk evaluation for AOC 6 are presented in **Appendix B, Tables B-20** through **B-43**.

1918 Drum Storage

Surface Soil

Three inorganics (aluminum, iron, and lead) exceeded screening values based on either maximum detected concentrations or pH. Aluminum and lead, but not iron, also exceeded background values (**Appendix B, Tables B-22** and **B-23**). Thus, aluminum and lead were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for aluminum and lead were less than 1.0. Thus, these two constituents were not identified as refined COPCs.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with surface soil.

Subsurface Soil

No constituent exceeded screening values based upon maximum detected concentrations and also exceeded background values, where available (**Appendix B, Tables B-28** and **B-29**). Thus, no unacceptable ecological risks are associated with subsurface soil.

Groundwater

Fourteen inorganics (aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) exceeded screening values based on maximum detected concentrations in unfiltered sample and also exceeded background values, where available (**Appendix B, Tables B-34** and **B-35**). Only aluminum exceeded screening values based on maximum detected concentrations in filtered sample and also exceeded the background value. Thus, aluminum was identified as an initial COPC.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- While the mean HQ for aluminum exceeded 1.0 based on undiluted concentrations, the mean HQ did not exceed 1.0 when a dilution factor of 10 was applied. Thus, aluminum was not identified as a refined COPC.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with groundwater.

Ammonia Settling Pits

Surface Soil

Three inorganics (aluminum, iron, and mercury) and one explosive (HMX) exceeded screening values based upon either maximum detected concentrations or pH; however, aluminum and iron did not exceed background values (**Appendix B, Tables B-20** and **B-21**). Screening values were not available for 1,3,5-trinitrobenzene and 1,3-dinitrobenzene. Thus, mercury, 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, and HMX were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, which did not have screening values, were detected at maximum concentrations of 2,100 and 100 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg. The maximum site concentrations of 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were less than the soil screening values for these other explosives. Thus, these two constituents were not identified as refined COPCs.

- The mean HQs for HMX and mercury were less than 1.0. Thus, these two constituents were not identified as refined COPCs.

No refined COPCs were identified. Thus, no unacceptable ecological risks are associated with surface soil.

Subsurface Soil

Only one constituent exceeded screening values based on maximum detected concentrations and also exceeded background values, where available. Aluminum exceeded the screening value, based on pH, and its maximum detected concentration exceeded the background value, thus it was identified as an initial COPC (**Appendix B, Tables B-26** and **B-27**). A screening value was not available for 1,3,5-trinitrobenzene, so it was identified as an initial COPC as well.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Aluminum exceeded its pH-based soil screening value in 4 of 5 samples, but only exceeded the background value in one sample. The pH of the one sample that exceeded the background value was greater than 5.5 (and thus did not exceed the screening value); therefore, aluminum was not identified as a refined COPC.
- 1,3,5-trinitrobenzene, which did not have a screening value, was detected at a maximum concentration of 41.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg. The maximum site concentration of 1,3,5-trinitrobenzene was less than the soil screening values for these other explosives. Thus, this constituent was not identified as a refined COPC.

No refined COPCs were identified. Thus, no unacceptable ecological risks are associated with subsurface soil.

Groundwater

Ten inorganics (aluminum, cadmium, chromium, cobalt, iron, lead, manganese, nickel, vanadium, and zinc) exceeded screening values based on maximum detected concentrations in unfiltered samples and also exceeded background values, where available (**Appendix B, Tables B-32** and **B-33**). Only cobalt, iron, and manganese exceeded screening values based on maximum detected concentrations in filtered sample and also exceeded background values, where available. Thus, cobalt, iron, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for cobalt did not exceed 1.0. Thus, cobalt was not identified as a refined COPC.

The mean HQs for iron and manganese exceeded 1.0 with a dilution factor of 10 applied. Thus, iron and manganese were identified as refined COPCs.

TNT Graining House and TNT Catch Box Ruins

Surface Soil

Six inorganics (aluminum, iron, lead, mercury, selenium, and zinc) and one explosive (2,4,6-TNT) exceeded screening values based on either maximum detected concentrations or pH. However, aluminum did not exceed both the screening value (pH) and background value in any sample. The maximum detected concentrations for the other five inorganics also exceeded background values, where available (**Appendix B, Tables B-24** and **B-25**). Screening values were not available for 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2-nitrotoluene, 3,5-dinitroaniline, and benzaldehyde. Thus, these 12 constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Benzaldehyde, which did not have a screening value, was detected at a maximum concentration of 320 µg/kg. This maximum concentration was compared with the range of soil screening values for all other SVOCs (not including atrazine, a herbicide) with such values. These values, which are provided in **Appendix B, Table B-1**,

ranged from 380 to 40,000 µg/kg. The maximum site concentration of benzaldehyde was less than the soil screening values for these other SVOCs. Thus, this constituent was not identified as a refined COPC.

- 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, and 3,5-dinitroaniline, which did not have screening values, were detected at maximum concentrations of 1,100, 730, and 890 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg. The maximum site concentrations of 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, and 3,5-dinitroaniline were less than the soil screening values for these other explosives. Thus, these three constituents were not identified as refined COPCs.
- The mean HQs for aluminum, iron, lead, mercury, and zinc were less than 1.0. Thus, these five constituents were not identified as refined COPCs.
- 2-Nitrotoluene, which did not have a screening value, was detected at a maximum concentration of 48,000 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg. The maximum site concentration of 2-nitrotoluene exceeded the soil screening values for some of these other explosives. Thus, this constituent was identified as a refined COPC.
- The mean HQ exceeded one for 2,4,6-TNT (69.7) and selenium (2.48); these two constituents were identified as refined COPCs.

Subsurface Soil

Three inorganics (aluminum, arsenic, and selenium) and two explosives (2,4-dinitrotoluene and 2,4,6-TNT) exceeded screening values based on either maximum detected concentrations or pH and also exceeded background values, where available (**Appendix B, Tables B-30** and **B-31**). Screening values were not available for 1,3-dinitrobenzene and 3,5-dinitroaniline. Thus, these seven constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 1,3-dinitrobenzene and 3,5-dinitroaniline, which did not have screening values, were detected at maximum concentrations of 1,600 and 550 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg. The maximum site concentrations of 1,3-dinitrobenzene and 3,5-dinitroaniline were less than the soil screening values for these other explosives. Thus, these two constituents were not identified as refined COPCs.
- The mean HQs for 2,4-dinitrotoluene, aluminum, and arsenic were less than 1.0. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded one for 2,4,6-TNT (48.1) and selenium (1.76); these two constituents were identified as refined COPCs.

Groundwater

Twelve inorganics (aluminum, arsenic, beryllium, chromium, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc) exceeded screening values based on maximum detected concentrations in unfiltered sample and also exceeded background values, where available (**Appendix B, Tables B-36** and **B-37**). Aluminum, chromium, copper, iron, lead, manganese, and silver exceeded screening values based on maximum detected concentrations in filtered sample and also exceeded background values, where available. Thus, aluminum, chromium, copper, iron, lead, manganese, and silver were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for chromium did not exceed 1.0. Thus, chromium was not identified as a refined COPC.
- While the mean HQs for copper, lead, manganese, and silver exceeded 1.0 based on undiluted concentrations, the mean HQs did not exceed 1.0 when a dilution factor of 10 was applied. Thus, none of these four constituents was identified as a refined COPC.

The mean HQs for aluminum and iron exceeded 1.0 with a dilution factor of 10 applied. Thus, aluminum and iron were identified as refined COPCs.

Penniman Lake Surface Water and Sediment

Surface Water

Barium exceeded screening values based on maximum detected concentrations (**Appendix B, Tables B-38** and **B-39**). Exceedances occurred in both filtered and unfiltered samples. Thus, barium was identified as an initial COPC.

The initial COPC was then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The screening value for barium (4 µg/L) is very conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural water bodies but is very toxic, while the surface water sample was measured for total barium. For comparison, the USEPA Region 5 freshwater screening value for total barium is 200 µg/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 µg/L). Thus, this screening value does not reflect the bioavailability of barium in the aquatic environment. Barium compounds have low toxicity to aquatic organisms, with the barium ion responsible for the toxic effects (Federal Register, 62[2]:366–372, 3 January 1997). In aquatic media, barium compounds are likely to precipitate out of solution as barium sulfate ($BaSO_4$) or barium carbonate ($BaCO_3$) when they react with the sulfate or carbonate present in most surface water. Thus, the barium is rendered essentially nontoxic and does not represent a risk to aquatic organisms. Barium was also not identified as a COPC in sediment. Thus, barium is not identified as a refined COPC in surface water.

No refined COPCs were identified. Thus, no unacceptable ecological risks are associated with surface water.

Surface Sediment

Arsenic and 4-amino-2,6-dinitrotoluene exceeded screening values based upon maximum detected concentrations (**Appendix B, Tables B-40 and B-41**). Bis(2-ethylhexyl)phthalate exceeded the screening level concentration (SLC) screening value, but not the Equilibrium Partitioning (EqP) based screening value, based upon the maximum detected concentration.[13] However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC. A screening value was not available for beryllium, which was detected in both surface sediment samples. Thus, arsenic, 4-amino-2,6-dinitrotoluene, and beryllium were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for arsenic and 4-amino-2,6-dinitrotoluene were less than 1.0. In addition, neither chemical exceeded screening values in the field duplicate of the one sample that exceeded the screening value (the chemicals were not detected in the field duplicate at reporting limits less than the screening values). Thus, these two constituents were not identified as refined COPCs.

[13]Detected organic chemicals in sediment were screened against both Screening Level Concentration (SLC) based screening values and Equilibrium Partitioning (EqP) based screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Appendix B, Table B-3.

- Beryllium did not have an available screening value. However, this constituent is not known to be associated with any site activities and is thus not identified as a refined COPC.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this surface sediment medium.

Subsurface Sediment

2,6-dinitrotoluene exceeded screening values based on maximum detected concentrations (**Appendix B, Tables B-42** and **B-43**). A screening value was not available for beryllium, which was detected in both subsurface sediment samples. Thus, these two constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for 2,6-dinitrotoluene was less than 1.0. Thus, this constituent was not identified as a refined COPC.
- Beryllium did not have an available screening value. However, this constituent is not known to be associated with any site activities and is thus not identified as a refined COPC.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with subsurface sediment.

5.3 AOC 6 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Analysis and are summarized in **Table 5-12**.

5.3.1 Step 1—Determination of Potential CERCLA Eligibility and, if CERCLA-Eligible, has a CERCLA-Related Release Occurred at the Site?

Based on historical information and observations made during the SI field activities, the following indicates:

- The 1918 Drum Storage subarea was formerly used for the storage of wooden barrels and 55-gallon drums when the shell loading facility was active; however, documentation regarding the contents of these barrels and drums is unknown.
- The Ammonia Settling Pits subarea were three buildings associated with the PSLP; ammonia settling occurred in Building 123, ammonia evaporating occurred in Building 124, and ammonia finishing occurred in Building 125. Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in these buildings is unknown.
- The TNT Graining House Sump and TNT Catch Box Ruins were formerly used as a sump and for settling out TNT particles from wastewater associated with the TNT Graining House (Building 121). Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in Building 121 is unknown.

Because the 1918 Drum Storage subarea, Ammonia Settling Pits, and TNT Graining House Sump and Catch Box Ruins were listed as SSAs within the FFA as sites that “may pose a threat, or potential threat, to human health and the environment” (Navy, 2005), and because SVOCs, explosives, and inorganic constituents were detected above background concentrations during the SI, AOC 6 is considered to be CERCLA-eligible. AOC 6 is further evaluated in the decision analysis process in Step 2a.

5.3.2 Step 2— Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a – Comparison of Data Against Conservative Risk-Based Screening Values

Specifically, the data for the CERCLA-related constituents detected at AOC 6 were compared to the screening criteria described in Section 1 and exceedances of the screening criteria are identified on **Tables 5-1** through **5-11**.

Those constituents that exceed one or more criteria (and background, if available, for inorganics) are shown in **Figures 5-8** through **5-17**.

1918 Drum Storage

In summary, two inorganics (aluminum and lead) exceeded screening criteria in surface soil and two inorganics (aluminum and thallium) exceeded screening criteria in subsurface soil. Sixteen total inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, thallium, vanadium, and zinc) and two dissolved inorganics (aluminum and thallium) exceeded screening criteria in groundwater.

Ammonia Settling Pits

In summary, three SVOCs (benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene), one explosive (HMX), and one inorganic (mercury) exceeded screening criteria in surface soil and one inorganic (aluminum) exceeded screening criteria in subsurface soil. Eleven total inorganics (aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, nickel, vanadium, and zinc) and three dissolved inorganics (cobalt, iron, and manganese) exceeded screening criteria in groundwater.

TNT Graining House Sump and TNT Catch Box Ruins

In summary, one SVOC (2,4-dinitrotoluene), six explosives (1,3-dinitrobenzene, 2,4,6-TNT, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, and 4-amino-2,6-dinitrotoluene), and ten inorganics (aluminum, arsenic, chromium, iron, lead, mercury, selenium, thallium, vanadium, and zinc) exceeded screening criteria in surface soil and one SVOC (2,4,-dinitrotoluene), three explosives (1,3-dinitrobenzene, 2,4,6-TNT, and 4-amino-2,6-dinitrotoluene), and seven inorganics (aluminum, arsenic, chromium, iron, selenium, thallium, and vanadium) exceeded screening criteria in subsurface soil. Thirteen total inorganics (aluminum, arsenic, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc) and ten dissolved inorganics (aluminum, arsenic, chromium, cobalt, copper, iron, lead, manganese, silver, and thallium) exceeded screening criteria in groundwater.

Penniman Lake Surface Water and Sediment

In summary, barium (total and dissolved) and thallium (total) exceeded screening criteria in surface water. One explosive (4-amino-2,6-dinitoluene) and two inorganics (arsenic and chromium) exceeded screening criteria is surface sediment, while one SVOC (2,6-dinitrotoluene) and two inorganics (arsenic and chromium) exceeded screening criteria in subsurface sediment.

Step 2b – Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

Human Health Risk Evaluation

1918 Drum Storage

Exposure to surface and subsurface soil in this subarea would not be expected to result in any unacceptable human health risks.

Exposure to groundwater in this subarea may result in unacceptable human health risks associated with aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, thallium, and vanadium detected in groundwater. This potential risk is based on total inorganics detected in the groundwater; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum and thallium were the only inorganics detected in the dissolved fraction. Aluminum is likely attributable to background and the one detection of dissolved thallium is within one order of magnitude of the unadjusted Tapwater RSL; therefore, no unacceptable human health risk above background is expected.

Ammonia Settling Pits

Exposure to surface and subsurface soil in this subarea would not be expected to result in any unacceptable human health risks.

Exposure to groundwater at the AOC 6 Ammonia Settling Pits subarea may result in unacceptable human health risks associated with aluminum, arsenic, chromium, cobalt, iron, and manganese.

TNT Graining House Sump and TNT Catch Box Ruins

Exposure to surface soil in these subareas may result in unacceptable human health risks associated with 2,4-dinitrotoluene, 2,4,6-TNT, 2-nitrotoluene, arsenic, and chromium. The primary contributors to the potential unacceptable carcinogenic risk are 2,4,6-TNT and chromium. Exposure to subsurface soil in these subareas may result in unacceptable human health risks associated with 2,4-dinitrotoluene, 2,4,6-TNT, arsenic, and chromium. The potential unacceptable carcinogenic risk is primarily associated with 2,4,6-TNT and chromium. Exposure to groundwater in these subareas may result in unacceptable human health risks associated with aluminum, arsenic, beryllium, chromium, cobalt, iron, lead, manganese, and vanadium.

Penniman Lake Surface Water and Sediment

Exposure to surface water and sediment in Penniman Lake, adjacent to the Ammonia Settling Pits, TNT Graining House Sump, and TNT Catch Box Ruins subareas, would not be expected to result in any unacceptable human health risks.

Ecological Risk Evaluation

1918 Drum Storage

No potential unacceptable ecological risks were identified with exposure to surface soil, subsurface soil or groundwater within this subarea.

Ammonia Settling Pits

No potential unacceptable ecological risks were identified with exposure to surface and subsurface soil. Potential unacceptable risks were identified with exposure to groundwater attributable to iron and manganese within this subarea.

TNT Graining House Sump and TNT Catch Box Ruins

- Potential unacceptable risks were identified with exposure to surface soil attributable to 2-nitrotoluene, 2,4,6-TNT, and selenium, to subsurface soil attributable to 2,4,6-TNT and selenium, and to groundwater attributable to aluminum and iron.

AOC 6 – Penniman Lake Surface Water and Sediment

No potential unacceptable ecological risks were identified with exposure to surface water or sediment (surface and subsurface) within this subarea.

5.3.3 Step 3—Is Further Investigation or Action Required?

Results from the soil, groundwater, surface water, and sediment sampling activities indicate the following:

<u>1918 Drum Storage</u>

Since no potential human health or ecological risks were identified, NFA is recommended. A consensus letter will be prepared for CAX Partnering Team review to capture the NFA recommendation, including a risk assessment using existing data.

<u>Ammonia Settling Pits</u>

Potentially unacceptable human health and ecological risks were associated with exposure to inorganics in groundwater. An ESI is recommended to install permanent monitoring wells and confirm potential groundwater inorganic constituent contamination and verify the groundwater flow direction.

TNT Graining House Sump, and TNT Catch Box Ruins

Potentially unacceptable human health and ecological risks were associated with exposure to SVOCs, explosives and inorganics in soil and inorganics in groundwater. An RI is recommended to characterize the nature and extent of contamination and conduct quantitative risk assessments. Permanent monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for SVOCs, explosives, inorganics, plus include a few chromium speciation analyses. It is recommended groundwater samples are analyzed for inorganics (total and dissolved).

Penniman Lake Surface Water and Sediment Adjacent to AOC 6

No potential human health or ecological risks were identified in the Penniman Lake surface water and sediment samples. However, since there are potentially unacceptable human health and ecological risks associated with exposure to SVOCs, explosives, and inorganics in soil at the two TNT subareas and with exposure to inorganics in groundwater at the Ammonia Settling Pits subarea, future Penniman Lake samples will include inorganic and explosive analyses, as appropriate and agreed to by the Partnering Team. These samples will be part of an RI for Penniman Lake and will not be collected as part of any AOC 6 follow-on investigations.

Table 5-12 summarizes the results of the decision analysis for each subarea of AOC 6.

TABLE 5-1
AOC 6 Surface Soil Detection and Exceedance Results; 1918 Drum Storage Subarea
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID					CAA06-SS14-1108	CAA06-SS15-1108	CAA06-SS16-1108	CAA06-SS17-1108	CAA06-SS18-1108	CAA06-SS19-1108	CAA06-SS19P-1108
Sample Date					11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name											
Semivolatile Organic Compounds (UG/KG)											
No Detections											
Explosives (UG/KG)											
No Detections											
Total Metals (MG/KG)											
Aluminum	12,200	pH < 5.5	99,000	7,700	**7,560**	**8,530**	**8,710**	**7,850**	**5,040**	**10,300**	**12,800***
Antimony	11	78.0	41	3.1	**0.11 L**	**0.5 L**	**0.07 L**	**0.05 L**	4.5 UL	5.1 UL	5.1 UL
Arsenic	6.36	18.0	1.6	0.39	**3.1**	**3**	**4.4**	**2.4**	**2.6**	**4.1**	**4.9**
Barium	52.9	330	19,000	1,500	**31**	**35.4**	**32.2**	**28**	**45.8**	**32**	**37.7**
Beryllium	0.587	40.0	200	16	**0.53**	**0.35 J**	**0.42**	**0.34**	**0.28 J**	**0.36 J**	**0.42 J**
Cadmium	1.5	32.0	80	7	**0.07 J**	**0.16 J**	**0.07 J**	**0.04 J**	**0.17 J**	**0.02 J**	0.42 U
Calcium	2,290	--	--	--	**1,230**	**1,760**	**8,080**	**712**	**560**	**481**	**706**
Chromium	18.2	64.0	5.6	0.29	**9.9**	**12.3**	**13.8**	**10.3**	**6.3**	**15**	**16.7**
Cobalt	9.93	13.0	30	2.3	**1.6 J**	**1.7 J**	**2 J**	**1.4 J**	**1.1 J**	**1.5 J**	**1.9 J**
Copper	4.25	70.0	4,100	310	**5.4**	**8.2**	**4.4**	**4.2**	**5.1**	**7.1**	**6.5**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**7,740**	**6,860**	**11,000**	**6,450**	**5,440**	**9,450**	**10,500**
Lead	17.4	120	800	400	**57.6**	**128**	**27.2**	**23.3**	**67.4**	**34.9**	**40.2**
Magnesium	1,070	--	--	--	**910**	**1,070**	**1,060**	**646**	**410**	**812**	**942**
Manganese	324	220	2,300	180	**95.1**	**82.9**	**66.9**	**58.7**	**71.2**	**33.4**	**55.9**
Mercury	0.111	0.10	31	2.3	**0.06 J**	**0.06 J**	0.12 U	0.12 U	0.1 U	**0.06 J**	**0.06 J**
Nickel	9.52	38.0	2,000	150	**3.9**	**3.9**	**5.9**	**3.6**	**2.9 J**	**4.3**	**4.8**
Potassium	708	--	--	--	**646**	**575**	**819**	**492**	**356 J**	**790**	**867**
Selenium	0.51	0.52	510	39	3.1 U	3.4 U	2.7 U	**0.31 J**	2.6 U	**0.35 J**	**0.37 J**
Silver	2.1	560	510	39	**0.62 J**	0.96 U	0.76 U	0.65 U	0.76 U	0.84 U	0.84 U
Sodium	521	--	--	--	**28.5 J**	**31.4 J**	**80.5 J**	**25.5 J**	**22.6 J**	**32.4 J**	**39.7 J**
Thallium	--	1.00	1[1]	0.078[1]	**0.07 J**	2.4 U	**0.06 J**	1.6 U	1.9 U	2.1 U	2.1 U
Vanadium	27.9	130	520	39	**15.5**	**16.3**	**16.9**	**14**	**8.9**	**20.2**	**23.4**
Zinc	26.5	120	31,000	2,300	**51.3**	**66.2**	**31.1**	**22.2**	**102**	**23.9**	**24.1**
Wet Chemistry											
% Solids (pct)	--	--	--	--	**79**	**86**	**88**	**84**	**91**	**88**	**89**
pH (ph)	--	--	--	--	**6**	**6.2**	**8.4**	**5.8**	**6.4**	**5**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**23,000**	**20,000**	**8,700**	**23,000**	**11,000**	**22,000**	NA

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG, ECO & Res RSL
Bold indicates detection
*Eco exceedance due to pH value
[1]Adjusted June 2011 RSL value
NA - Not analyzed
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
LMW PAH - Low molecular weight Polycyclic Aromatic Hydrocarbons
HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 5-2
AOC 6 Subsurface Soil Detection and Exceedance Results; 1918 Drum Storage Subarea
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID					CAA06-SB14-1108	CAA06-SB15-1108	CAA06-SB16-1108	CAA06-SB17-1108	CAA06-SB18-1108	CAA06-SB19-1108	CAA06-SB19P-1108
Sample Date					11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Sample Depth					6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"
Chemical Name											
Semivolatile Organic Compounds (UG/KG)											
No Detections											
Explosives (UG/KG)											
No Detections											
Total Metals (MG/KG)											
Aluminum	13,000	pH < 5.5	99,000	7,700	**9,530**	**12,700**	**13,200**	**12,700**	**5,770**	**11,200**	**11,100**
Antimony	--	78.0	41	3.1	**0.1 L**	**0.16 L**	**0.16 L**	**0.16 L**	4.9 UL	**0.08 L**	**0.11 L**
Arsenic	5.54	18.0	1.6	0.39	**4.1**	**5**	**4.2**	**2.6**	**2.2**	**3.8**	**3.4**
Barium	84.5	330	19,000	1,500	**44.5**	**37.8**	**27.4**	**32.7**	**31.1**	**42.5**	**41.9**
Beryllium	0.52	40.0	200	16	**0.45**	**0.48**	**0.35 J**	**0.31**	**0.23 J**	**0.47**	**0.42**
Cadmium	--	32.0	80	7	**0.03 J**	**0.04 J**	0.44 U	0.28 U	**0.08 J**	**0.04 J**	**0.02 J**
Calcium	2,380	--	--	--	**1,310**	**1,840**	**12,600**	**921**	**626**	**3,700**	**3,530**
Chromium	33.7	64.0	5.6	0.29	**12.6**	**20**	**16.6**	**14.7**	**8.4**	**18.3**	**19**
Cobalt	5.18	13.0	30	2.3	**1.8 J**	**2.4 J**	**1.9 J**	**1.4 J**	**0.95 J**	**2.1 J**	**1.9 J**
Copper	3.17	70.0	4,100	310	**4.6**	**5.2**	**2.8**	**3.7**	**4.2**	**6.2**	**5.5**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**9,960**	**12,700**	**11,900**	**9,900**	**5,800**	**12,000**	**11,100**
Lead	8.79	120	800	400	**19.3**	**60**	**9.6**	**7.6**	**20.1**	**19.8**	**22.9**
Magnesium	1,120	--	--	--	**840**	**1,120**	**1,140**	**732**	**432**	**1,150**	**1,040**
Manganese	176	220	2,300	180	**104**	**86.3**	**29**	**30.4**	**44.8**	**58.8**	**62.9**
Mercury	0.14	0.10	31	2.3	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	**0.04 J**	0.11 U
Nickel	17.6	38.0	2,000	150	**4.2**	**6.4**	**5.3**	**3.9**	**2.8 J**	**6.2**	**6.7**
Potassium	901	--	--	--	**621**	**1,030**	**960**	**409**	**342 J**	**781**	**765**
Selenium	0.64	0.52	510	39	2.7 U	2.9 U	3.1 U	**0.33 J**	2.9 U	3.2 U	2 U
Sodium	811	--	--	--	**29.9 J**	**33.4 J**	**119 J**	**27.8 J**	**20.5 J**	**50.3 J**	**49.6 J**
Thallium	--	1.00	1[1]	.078[1]	1.9 U	2 U	**0.08 J**	1.4 U	2.1 U	2.2 U	1.4 U
Vanadium	48.3	130	520	39	**18**	**25.4**	**23.2**	**22.2**	**11.6**	**21.6**	**20.4**
Zinc	28	120	31,000	2,300	**21.6**	**26.9**	**12.9**	**9.8**	**51.1**	**20.6**	**19.7**
Wet Chemistry											
% Solids (pct)	--	--	--	--	**87**	**88**	**87**	**90**	**94**	**92**	**93**
pH (ph)	--	--	--	--	**8.1**	**8.5**	**7.2**	**6.2**	**6.1**	**7.2**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**14,000**	**3,400**	**1,700**	**3,700**	**5,800**	**20,000**	NA

Notes:

Exceeds Background
Exceeds BKG & Res RSL
Bold indicates detection
-- - No value available
[1]Adjusted June 2011 RSL value
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 5-3

AOC 6 Groundwater Detection and Exceedance Results; 1918 Drum Storage Subarea

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater (Dec. 2010)	CLEAN RSLs Tapwater Adjusted (Dec. 2010)	CAA06-DW09	CAA06-DW10		CAA06-DW11
Sample ID					CAA06-DW09-1108	CAA06-DW10-1108	CAA06-DW10P1108	CAA06-DW11-1108
Sample Date					11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name								
Semivolatile Organic Compounds (UG/L)								
No Detections								
Explosives (UG/L)								
No Detections								
Total Metals (UG/L)								
Aluminum	2,230	87.0	--	3,700	**57,600**	**14,600 J**	**1,810 J**	**12,100**
Antimony	18.8	30.0	6	1.5	**8.8 J**	**3.8 J**	60 U	**3.6 J**
Arsenic	2.28	150	10	0.045	**134**	**53.1 J**	**11.4 J**	**24.6**
Barium	118	4.00	2,000	730	**208**	**87.1 J**	**48.7 J**	**68.5 J**
Beryllium	2.45	0.66	4	7.3	**4.1 J**	**1 J**	**0.18 J**	**0.8 J**
Cadmium	0.605	0.271	5	1.8	**5**	**1.4 J**	**0.18 J**	**0.57 J**
Calcium	169,000	--	--	--	**661,000**	**278,000**	**165,000**	**357,000**
Chromium	15.1	11.4	100	0.043	**250**	**59**	**7.2 J**	**84.8**
Cobalt	20.6	23.0	--	1.1	**23.3 J**	**7 J**	**1 J**	**6 J**
Copper	12.2	9.33	1,300	150	**60.2**	**23.1 J**	**9.8 J**	**26**
Iron	894	1,000	--	2,600	**116,000**	**32,100 J**	**5,090 J**	**27,800**
Lead	21.3	3.18	15	--	**50.1**	**14.6**	**2.5 J**	**11.9**
Magnesium	11,500	--	--	--	**20,700**	**6,770**	**2,840 J**	**5,510**
Manganese	57.9	120	--	88	**424**	**109 J**	**23.5 J**	**123**
Mercury	0.081	0.91	2	1.1	**0.04 L**	0.2 UL	0.2 UL	0.2 UL
Nickel	11.4	52.2	--	73	**86.7**	**26.5 J**	**4.7 J**	**43.9**
Potassium	12,700	--	--	--	**23,000**	**9,220**	**4,410 J**	**5,660**
Selenium	--	5.00	50	18	**5.8 J**	**5.5 J**	35 U	35 U
Sodium	64,500	--	--	--	**24,200**	**14,200**	**12,400**	**7,330**
Thallium	--	12.0	2	0.037	**2.1 J**	25 U	**1.7 J**	**2.2 J**
Vanadium	26.2	20.0	--	18	**325**	**85.5**	**9.6 J**	**52**
Zinc	4.52	120	--	1,100	**227**	**60.7**	**10.3 J**	**60.2**
Dissolved Metals (UG/L)								
Aluminum, Dissolved	100	87.0	--	3,700	**385**	**227**	**242**	**250**
Barium, Dissolved	127	4.00	2,000	730	**50 J**	**46.5 J**	**46.4 J**	**31.1 J**
Calcium, Dissolved	113,000	--	--	--	**192,000**	**166,000**	**166,000**	**142,000**
Chromium, Dissolved	6.04	11.0	100	0.043	**0.95 J**	10 U	10 U	0.58 B
Copper, Dissolved	3	8.96	1,300	150	**1.3 J**	**1.4 J**	**1.2 J**	**1.2 J**
Iron, Dissolved	275	1,000	--	2,600	**336**	39.6 B	18.2 B	**502**
Lead, Dissolved	1.7	2.52	15	--	**2.2 J**	**2.4 J**	**1.2 J**	**1.3 J**
Magnesium, Dissolved	11,200	--	--	--	**3,010 J**	**2,460 J**	**2,430 J**	**1,580 J**
Manganese, Dissolved	49.5	120	--	88	**30.5**	**23.3**	**24.1**	**17.7**

TABLE 5-3

AOC 6 Groundwater Detection and Exceedance Results; 1918 Drum Storage Subarea

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW YE AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Dec. 2010)**	**CLEAN RSLs Tapwater Adjusted (Dec. 2010)**	CAA06-DW09	CAA06-DW10		CAA06-DW11
Sample ID					CAA06-DW09-1108	CAA06-DW10-1108	CAA06-DW10P1108	CAA06-DW11-1108
Sample Date					11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name								
Nickel, Dissolved	12.2	52.0	--	73	**7.1 J**	**5.8 J**	**6.1 J**	**6.1 J**
Potassium, Dissolved	12,600	--	--	--	**2,950 J**	**3,770 J**	**3,780 J**	**912 J**
Sodium, Dissolved	62,800	--	--	--	**21,600**	**13,300**	**13,300**	**5,860**
Thallium, Dissolved	--	12.0	2	0.037[1]	**2 J**	25 U	25 U	25 U
Vanadium, Dissolved	4.3	20.0	--	18	**0.9 J**	50 U	50 U	50 U
Zinc, Dissolved	--	118	--	1,100	**3.2 J**	**3 J**	**2.9 J**	**4 J**

Notes:

Exceeds Background

Exceeds BKG & ECO

Exceeds BKG & Tapwater RSL

Exceeds BKG & MCL

Exceeds BKG, Tapwater RSL & MCL

Exceeds BKG, ECO & Tapwater RSL

Exceeds BKG, ECO & MCL

Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

[1]Adjusted June 2011 RSL value

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

TABLE 5-4

AOC 6 Surface Soil Detection and Exceedance Results; Ammonia Settling Pit Subarea

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA06-SO05	CAA06-SO06		CAA06-SO10	CAA06-SO11	CAA06-SO12
Sample ID					CAA06-SS05-1008	CAA06-SS06-1008	CAA06-SS06P-1008	CAA06-SS10-1108	CAA06-SS11-1108	CAA06-SS12-1108
Sample Date					10/21/08	10/21/08	10/21/08	11/06/08	11/06/08	11/06/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name										
Semivolatile Organic Compounds (UG/KG)										
2,4-Dinitrotoluene	--	11,000	5,500	1,600	**420**	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	--	--	62,000	6,100	100 U	100 U	100 U	**510**	100 U	100 U
Benzo(a)anthracene	--	HMW PAH	2,100	150	**230 J**	**140 J**	**230 J**	510 U	420 U	400 U
Benzo(a)pyrene	--	HMW PAH	210	15	**270 J**	**140 J**	**220 J**	510 U	420 U	400 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	**230 J**	**130 J**	**200 J**	510 U	420 U	400 U
Benzo(g,h,i)perylene	--	HMW PAH	1,700,000	170,000	**160 J**	380 U	**130 J**	510 U	420 U	400 U
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	**190 J**	**110 J**	**170 J**	510 U	420 U	400 U
Chrysene	--	HMW PAH	210,000	15,000	**440**	**250 J**	**440**	510 U	420 U	400 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	**320 J**	**160 J**	**240 J**	510 U	420 U	400 U
Indeno(1,2,3-cd)pyrene	--	HMW PAH	2,100	150	**100 J**	380 U	380 U	510 U	420 U	400 U
PAH (HMW)	--	18,000	--	--	**2,600 J**	**1,720 J**	**2,370 J**	**2,210 J**	1,890 U	1,800 U
PAH (LMW)	--	29,000	--	--	**1,930 J**	**1,610 J**	**1,780 J**	2,295 U	1,890 U	1,800 U
Phenanthrene	--	LMW PAH	17,000,000	1,700,000	**280 J**	**120 J**	**210 J**	510 U	420 U	400 U
Pyrene	--	HMW PAH	1,700,000	170,000	**790**	**380 J**	**600**	**170 J**	420 U	400 U
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	--	--	2,700,000	220,000	100 U	**120**	100 U	**2,100**	100 U	100 U
1,3-Dinitrobenzene	--	--	6,200	610	**100**	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	--	10,000	42,000	3,600	**990**	**2,000**	**2,900**	**150**	100 U	100 U
2-Amino-4,6-dinitrotoluene	--	80,000	200,000	15,000	100 U	**120**	**110**	100 U	100 U	100 U
HMX	--	10,000	4,900,000	380,000	200 U	200 U	200 U	**20,000**	200 U	200 U
Total Metals (MG/KG)										
Aluminum	12,200	pH < 5.5	99,000	7,700	**11,100**	**4,800**	**4,800**	**8,220**	**4,390**	**11,100**
Antimony	11	78.0	41	3.1	6.2 UL	**0.06 L**	**0.06 L**	**0.73 L**	4.8 UL	6.3 UL
Arsenic	6.36	18.0	1.6	0.39	**3.6 J**	**2.2 J**	**2 J**	**3.3 L**	**1.8 L**	**3.9 L**
Barium	52.9	330	19,000	1,500	**31.4**	**16.2 J**	**14.6 J**	**16.6 K**	**16.1 K**	**27.4 K**
Beryllium	0.587	40.0	200	16	**0.42 J**	**0.17 J**	**0.15 J**	**0.27 J**	**0.22 J**	**0.39 J**
Cadmium	1.5	32.0	80	7	**0.09 J**	**0.08 J**	**0.07 J**	0.04 B	0.03 B	0.53 U
Calcium	2,290	--	--	--	**514**	**268 J**	**97.6 J**	**1,760**	**185 J**	**295 J**
Chromium	18.2	64.0	5.6	0.29	**12.9 L**	**6.7 L**	**6.8 L**	**12.5**	**5**	**13.8**
Cobalt	9.93	13.0	30	2.3	**2.2 J**	**0.86 J**	**0.85 J**	**1.7 J**	**0.78 J**	**2.4 J**
Copper	4.25	70.0	4,100	310	**5.3**	**31.6**	**29.6**	6.3 B	3 B	4.1 B
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**8,680 J**	**4,860 J**	**4,940 J**	**6,170**	**3,970**	**9,840**
Lead	17.4	120	800	400	**22.6 J**	**69.6 J**	**73.6 J**	**26.4**	**33**	**18.1**
Magnesium	1,070	--	--	--	**767**	**332 J**	**312 J**	**533**	**313 J**	**669**
Manganese	324	220	2,300	180	**49.5**	**24.9**	**20.7**	**29.2 L**	**19.2 L**	**57.1 L**
Mercury	0.111	0.10	31	2.3	**0.06 L**	**0.14**	**0.18**	0.16 UL	**0.08 L**	**0.06 L**
Nickel	9.52	38.0	2,000	150	**7**	**3.1 J**	**3 J**	**4.6**	**2.6 J**	**5.9**
Potassium	708	--	--	--	**496 J**	**264 J**	**260 J**	**495 J**	**235 J**	**456 J**
Selenium	0.51	0.52	510	39	**0.39 J**	3.6 U	3.1 U	3 U	2.8 U	**0.44 J**
Sodium	521	--	--	--	**51.1 J**	**34.2 J**	**30.7 J**	45 B	21.3 B	20.4 B
Vanadium	27.9	130	520	39	**22**	**12.5**	**12.4**	**17**	**10.6**	**22.2**
Zinc	26.5	120	31,000	2,300	**30.1**	**16.6**	**15**	**22.1 K**	**9.8 K**	**19.2 K**

TABLE 5-4

AOC 6 Surface Soil Detection and Exceedance Results; Ammonia Settling Pit Subarea

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA06-SO05	CAA06-SO06		CAA06-SO10	CAA06-SO11	CAA06-SO12
Sample ID					CAA06-SS05-1008	CAA06-SS06-1008	CAA06-SS06P-1008	CAA06-SS10-1108	CAA06-SS11-1108	CAA06-SS12-1108
Sample Date					10/21/08	10/21/08	10/21/08	11/06/08	11/06/08	11/06/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name										
Wet Chemistry										
% Solids (pct)	--	--	--	--	**87**	**86**	**88**	**65**	**78**	**83**
pH (ph)	--	--	--	--	**4.9**	**4.3**	NA	**6.3**	**4.6**	**5**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**42,000 J**	**50,000 J**	NA	**40,000**	**28,000**	**26,000**

Notes:

Exceeds Background

Exceeds BKG & ECO

Exceeds BKG & Res RSL

Exceeds BKG, Res & Ind RSLs

Bold indicates detection

-- - No value available

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

LMW PAH - Low molecular weight Polycyclic Aromatic Hydrocarbons

HMW PAH - High molecular weight Polycyclic Aromatic Hydrocarbons

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 5-5
AOC 6 Subsurface Soil Detection and Exceedance Results; Ammonia Settling Pit Subarea
Site Inspection Report: AOCs 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Dec. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Dec. 2010)**	CAA06-SO05	CAA06-SO06		CAA06-SO10	CAA06-SO11	CAA06-SO12
Sample ID					CAA06-SB05-1008	CAA06-SB06-1008	CAA06-SB06P-1008	CAA06-SB10-1108	CAA06-SB11-1108	CAA06-SB12-1108
Sample Date					10/21/08	10/21/08	10/21/08	11/06/08	11/06/08	11/06/08
Sample Depth					6-24"	6-24"	6-24"	6-24"	6-24"	6-24"
Chemical Name										
Semivolatile Organic Compounds (UG/KG)										
No Detections										
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	--	--	2,700,000	220,000	100 U	100 U	**41 J**	99 U	100 U	99 U
2,4,6-Trinitrotoluene	--	10,000	42,000	3,600	100 U	**100**	100 U	**100**	100 U	99 U
Total Metals (MG/KG)										
Aluminum	13,000	pH < 5.5	99,000	7,700	**9,520**	**12,400**	**7,480**	**15,900**	**5,140**	**6,360**
Antimony	--	78.0	41	3.1	4.4 UL	**0.07 L**	5.5 UL	4.6 UL	5.1 UL	5.8 UL
Arsenic	5.54	18.0	1.6	0.39	**2.9 J**	**3.2 J**	**2.2 J**	**4.9 L**	**1.8 L**	**4 L**
Barium	84.5	330	19,000	1,500	**22.4**	**24.9**	**18.5**	**16.1 K**	**15.2 K**	**21.3 K**
Beryllium	0.52	40.0	200	16	**0.38**	**0.42 J**	**0.27 J**	**0.38 J**	**0.24 J**	**0.38 J**
Cadmium	--	32.0	80	7	**0.02 J**	**0.04 J**	**0.02 J**	0.38 U	0.42 U	0.48 U
Calcium	2,380	--	--	--	126 B	**118 J**	**77.9 J**	**718**	**83 J**	**114 J**
Chromium	33.7	64.0	5.6	0.29	**11.4 L**	**12.5 L**	**8.4 L**	**25.8**	**5.7**	**8**
Cobalt	5.18	13.0	30	2.3	**1.9 J**	**2.4 J**	**1.5 J**	**3.5 J**	**0.99 J**	**1.5 J**
Copper	3.17	70.0	4,100	310	**2.5**	**29.8 J**	**4 J**	4.8 B	4.5 B	1.8 B
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**7,520 J**	**9,080 J**	**5,820 J**	**14,800**	**4,130**	**6,860**
Lead	8.79	120	800	400	**7.1 J**	**91.7 J**	**18.1 J**	**9.4**	**10.2**	**5.6**
Magnesium	1,120	--	--	--	**696**	**762**	**544**	**939**	**366 J**	**479 J**
Manganese	176	220	2,300	180	**39.4**	**39.4**	**32.1**	**16.5 L**	**20.7 L**	**28.8 L**
Mercury	0.14	0.10	31	2.3	0.11 UL	**0.07 L**	0.12 UL	0.084 UL	0.11 UL	0.11 UL
Nickel	17.6	38.0	2,000	150	**5.7**	**7.6**	**4.1**	**6.9**	**2.8 J**	**3.8**
Potassium	901	--	--	--	**438**	**460 J**	**328 J**	**874 J**	**218 J**	**290 J**
Selenium	0.64	0.52	510	39	**0.42 J**	**0.43 J**	**0.34 J**	**0.48 J**	3 U	3.4 U
Sodium	811	--	--	--	**24.2 J**	**29.8 J**	**21.5 J**	**47.6 J**	13 B	18.9 B
Vanadium	48.3	130	520	39	**17.5**	**19.6**	**13.5**	**30.4**	**9.2**	**16.7**
Zinc	28	120	31,000	2,300	**15.7**	**55.5 J**	**15.1 J**	**20.9 K**	**9.7 K**	**11.3 K**
Wet Chemistry										
% Solids (pct)	--	--	--	--	**93**	**81**	**92**	**82**	**89**	**82**
pH (ph)	--	--	--	--	**4.8**	**4.7**	NA	**6**	**5.1**	**5.1**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**7,000 J**	**15,000 J**	NA	**3,300**	**7,300**	**5,200**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 5-6
AOC 6 Groundwater Detection and Exceedance Results; Ammonia Settling Pit Subarea
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW YE AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Dec. 2010)**	**CLEAN RSLs Tapwater Adjusted (Dec. 2010)**	CAA06-DW02	CAA06-DW03	CAA06-DW04	
Sample ID					CAA06-DW02-1108	CAA06-DW03-1108	CAA06-DW04-1108	CAA06-DW04P-1108
Sample Date					11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name								
Semivolatile Organic Compounds (UG/L)								
No Detections								
Explosives (UG/L)								
No Detections								
Total Metals (UG/L)								
Aluminum	2,230	87.0	--	3,700	**16,800**	**3,860**	**1,980**	**2,860**
Arsenic	2.28	150	10	0.045	**47.4**	**25.3**	4.8 B	6.8 B
Barium	118	4.00	2,000	730	**20.4 J**	**14.4 J**	**29.5 J**	**31.6 J**
Beryllium	2.45	0.66	4	7.3	**2 J**	**0.66 J**	**0.24 J**	**0.45 J**
Cadmium	0.605	0.271	5	1.8	**1.7 J**	**1 J**	0.34 B	**0.33 J**
Calcium	169,000	--	--	--	**41,300**	**35,300**	**25,600**	**25,500**
Chromium	15.1	11.4	100	0.043	**42.5**	**9.3 J**	**5.8 J**	**7.7 J**
Cobalt	20.6	23.0	--	1.1	**25.5 J**	**7.8 J**	**28.1 J**	**30.4 J**
Iron	894	1,000	--	2,600	**126,000**	**65,300**	**6,180**	**8,730**
Lead	21.3	3.18	15	--	**22.3**	**5.6 J**	**3.6 J**	**4.4 J**
Magnesium	11,500	--	--	--	**5,770**	**4,060 J**	**6,720**	**6,620**
Manganese	57.9	120	--	88	**1,070**	**320**	**3,000**	**2,970**
Mercury	0.081	0.91	2	1.1	**0.04 J**	0.2 U	0.2 U	0.2 U
Nickel	11.4	52.2	--	73	**53.8**	**11.6 J**	**12.1 J**	**14.4 J**
Potassium	12,700	--	--	--	**4,610 J**	**2,070 J**	**1,230 J**	**1,320 J**
Sodium	64,500	--	--	--	**11,100**	**11,400**	**17,200**	**16,800**
Vanadium	26.2	20.0	--	18	**52.3**	**10.3 J**	**3.7 J**	**5.1 J**
Zinc	4.52	120	--	1,100	**160**	**48.4 J**	**20 J**	**27.4 J**
Dissolved Metals (UG/L)								
Arsenic, Dissolved	1.37	150	10	0.045	**17.5**	**18.4**	**2.9 J**	10 U
Barium, Dissolved	127	4.00	2,000	730	**4.2 J**	**4 J**	**25.9 J**	**22.8 J**
Calcium, Dissolved	113,000	--	--	--	**41,800**	**33,700**	**28,400**	**23,400**
Cobalt, Dissolved	0.7	23.0	--	1.1	**5.7 J**	50 U	**22.8 J**	**25.2 J**
Iron, Dissolved	275	1,000	--	2,600	**42,500**	**51,400**	**846**	**1,100**
Lead, Dissolved	1.7	2.52	15	--	**1.7 J**	**1.4 J**	**1.3 J**	10 U
Magnesium, Dissolved	11,200	--	--	--	**4,140 J**	**3,460 J**	**7,070**	**6,570**
Manganese, Dissolved	49.5	120	--	88	**983**	**249**	**3,150**	**3,170**
Nickel, Dissolved	12.2	52.0	--	73	**7.6 J**	40 U	**6.2 J**	**7.5 J**
Potassium, Dissolved	12,600	--	--	--	**2,220 J**	**1,340 J**	**1,140 J**	**994 J**
Sodium, Dissolved	62,800	--	--	--	**11,200**	**11,300**	**17,400**	**18,500**
Vanadium, Dissolved	4.3	20.0	--	18	50 U	**0.53 J**	50 U	50 U
Zinc, Dissolved	--	118	--	1,100	**15.4 J**	2.2 B	**4.7 J**	**13.4 J**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Tapwater RSL
Exceeds BKG, Tapwater RSL & MCL
Exceeds BKG, ECO & Tapwater RSL
Exceeds BKG, ECO & MCL
Bold indicates detection
-- No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
R - Unreliable Result
U - Analyte not detected
UG/L - Micrograms per liter

TABLE 5-7
AOC 6 Surface Soil Detection and Exceedance Results; TNT Graining House and Catch Box Ruins Subarea
Site Inspection Reports: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO07	CAA06-SO08	CAA06-SO13
Sample ID					CAA06-SS01-1008	CAA06-SS02-1008	CAA06-SS03-1008	CAA06-SS04-1008	CAA06-SS07-1108	CAA06-SS08-1108	CAA06-SS13-1108
Sample Date					10/20/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name											
Semivolatile Organic Compounds (UG/KG)											
2,4-Dinitrotoluene	--	11,000	5,500	1,600	**6,300 L**	**140 J**	100 U	100 U	100 U	99 U	**290**
Benzaldehyde	--	--	1,200,000	780,000	**320 J**	380 U	380 U	380 U	460 U	430 U	370 U
Benzo(a)anthracene	--	HMW PAH	2,100	150	**110 J**	380 U	380 U	380 U	460 U	430 U	370 U
Chrysene	--	HMW PAH	210,000	15,000	**150 J**	380 U	380 U	380 U	460 U	430 U	370 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	**300 J**	380 U	380 U	380 U	460 U	430 U	370 U
PAH (HMW)	--	18,000	--	--	**2,070 J**	1,710 U	1,710 U	1,710 U	2,070 U	1,935 U	1,665 U
PAH (LMW)	--	29,000	--	--	**1,940 J**	1,710 U	1,710 U	1,710 U	2,070 U	1,935 U	1,665 U
Pyrene	--	HMW PAH	1,700,000	170,000	**580 J**	380 U	380 U	380 U	460 U	430 U	370 U
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	--	--	2,700,000	220,000	**620 K**	**250**	100 U	100 U	100 U	99 U	**1,100**
1,3-Dinitrobenzene	--	--	6,200	610	**730 J**	**84 J**	100 UJ	100 U	100 U	99 U	**290**
2,4,6-Trinitrotoluene	--	10,000	42,000	3,600	**4,500,000**	**320,000**	**6,600**	**170**	100 U	99 U	**51,000**
2-Amino-4,6-dinitrotoluene	--	80,000	200,000	15,000	100 UJ	**16,000 J**	**1,400 J**	100 U	100 U	99 U	**15,000**
2-Nitrotoluene	--	--	13,000	2,900	40,000 R	**48,000 J**	200 UJ	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	--	--	--	--	100 U	100 U	100 U	100 U	100 U	99 UJ	**890**
4-Amino-2,6-dinitrotoluene	--	80,000	190,000	15,000	20,000 R	**17,000**	**1,400**	100 U	100 U	99 U	**14,000**
RDX	--	10,000	24,000	5,500	**220**	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	--	10,000	250,000	24,000	**640**	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)											
Aluminum	12,200	pH < 5.5	99,000	7,700	**10,600**	**10,400**	**25,000**	**9,630**	**5,230**	**6,780**	**11,400**
Antimony	11	78.0	41	3.1	14 UL	4.1 UL	**0.21 L**	**0.1 L**	4.5 UL	7.4 UL	4 UL
Arsenic	6.36	18.0	1.6	0.39	**8.1 J**	**3.5 J**	**11.8 J**	**3.6 J**	**2.7 L**	**3.3 L**	**5 L**
Barium	52.9	330	19,000	1,500	**31**	**22.9**	**45.7**	**18.8 J**	**21.2 K**	**18.3 K**	**25.2 K**
Beryllium	0.587	40.0	200	16	**0.34 J**	**0.36**	**0.55**	**0.29 J**	**0.4**	**0.26 J**	**0.39**
Cadmium	1.5	32.0	80	7	**0.06 J**	**0.09 J**	**0.12 J**	**0.04 J**	0.38 U	0.05 B	0.02 B
Calcium	2,290	--	--	--	**2,260**	**748**	**1,980**	**1,210**	**304 J**	**869**	**415**
Chromium	18.2	64.0	5.6	0.29	**16.8 L**	**12.5 L**	**34.7 L**	**16.2 L**	**6.1**	**8.6**	**13.9**
Cobalt	9.93	13.0	30	2.3	**3.6 J**	**2.2 J**	**3.4 J**	**1.9 J**	**2.6 J**	**1.3 J**	**2.4 J**
Copper	4.25	70.0	4,100	310	**9.8**	**6.7**	**5.5**	**3.6**	2.2 B	4.8 B	4.2 B
Cyanide	--	15.8	2,000	160	0.6 U	0.55 U	0.55 U	0.5 U	0.7 U	0.6 U	**1.3**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**37,100* J**	**9,000 J**	**21,700 J**	**9,010 J**	**4,780**	**6,270**	**10,300**
Lead	17.4	120	800	400	**580 J**	**72.9 J**	**42.8 J**	**9.9 J**	**10.8**	**18.5**	**101**
Magnesium	1,070	--	--	--	**896 J**	**672**	**1,270**	**694**	**406**	**468 J**	**747**
Manganese	324	220	2,300	180	**175**	**43.3**	**32.8**	**25.4**	**50.5 L**	**30.9 L**	**41.1 L**
Mercury	0.111	0.10	31	2.3	**0.13 L**	**0.05 L**	0.12 UL	0.11 UL	0.15 UL	**0.06 L**	**0.08 L**
Nickel	9.52	38.0	2,000	150	**10.1**	**6.6**	**10**	**4.8**	**3.7**	**4.1 J**	**7**
Potassium	708	--	--	--	**719**	**620**	**1,520**	**875**	**254 J**	**438 J**	**589 J**
Selenium	0.51	0.52	510	39	**2 J**	**0.38 J**	**0.91 J**	3.8 U	2.6 U	4.3 U	**0.38 J**
Sodium	521	--	--	--	**68 J**	**29.5 J**	**58.7 J**	**28.6 J**	19 B	36.3 B	27.2 B
Thallium	--	1.00	1[1]	.078[1]	5.7 U	1.7 U	**0.18 J**	2.7 U	1.9 U	3.1 U	0.09 B
Vanadium	27.9	130	520	39	**26.6**	**19.6**	**50**	**22.1**	**10.3**	**18.1**	**22.5**
Zinc	26.5	120	31,000	2,300	**96.7**	**54.9**	**176**	**17**	**12.2 K**	**18.6 K**	**25.9 K**
Wet Chemistry											
% Solids (pct)	--	--	--	--	**80**	**88**	**86**	**88**	**72**	**76**	**88**
pH (ph)	--	--	--	--	**4.6**	**6.8**	**7.1**	**7.1**	**5.4**	**5**	**5**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**120,000 J**	**7,300 J**	**6,200 J**	**27,000 J**	**22,000**	**49,000**	**30,000**

TABLE 5-7
AOC 6 Surface Soil Detection and Exceedance Results; TNT Graining House and Catch Box Ruins Subarea
Site Inspection Reports: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO07	CAA06-SO08	CAA06-SO13
Sample ID					CAA06-SS01-1008	CAA06-SS02-1008	CAA06-SS03-1008	CAA06-SS04-1008	CAA06-SS07-1108	CAA06-SS08-1108	CAA06-SS13-1108
Sample Date					10/20/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name											

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection

[1]Adjusted June 2011 RSL value
*Eco exceedance due to pH value
-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 5-8
AOC 6 Subsurface Soil Detection and Exceedance Results; TNT Graining House and Catch Box Ruins Subarea
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted (Dec. 2010)	CLEAN RSLs Residential Soil Adjusted (Dec. 2010)	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO07	CAA06-SO08	CAA06-SO13
Sample ID					CAA06-SB01-1008	CAA06-SB02-1008	CAA06-SB03-1008	CAA06-SB04-1008	CAA06-SB07-1108	CAA06-SB08-1108	CAA06-SB13-1108
Sample Date					10/20/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08
Sample Depth					6-24"	6-24"	6-24"	6-24"	6-24"	6-24"	6-24"
Chemical Name											
Semivolatile Organic Compounds (UG/KG)											
2,4-Dinitrotoluene	--	11,000	5,500	1,600	**12,000**	100 U	100 U	100 U	100 U	100 U	**1,600**
Explosives (UG/KG)											
1,3-Dinitrobenzene	--	--	6,200	610	**1,600 J**	100 UJ	**28 J**	100 U	100 U	100 U	**290**
2,4,6-Trinitrotoluene	--	10,000	42,000	3,600	**2,700,000**	**6,700**	**1,400**	100 U	100 U	100 U	**660,000**
2-Amino-4,6-dinitrotoluene	--	80,000	200,000	15,000	99 UJ	**610 J**	**650 J**	100 U	100 U	100 U	**15,000**
3,5-Dinitroaniline	--	--	--	--	99 U	100 U	100 U	100 U	100 U	100 UJ	**550**
4-Amino-2,6-dinitrotoluene	--	80,000	190,000	15,000	99 U	100 U	**340**	100 U	100 U	100 U	**30,000**
Total Metals (MG/KG)											
Aluminum	13,000	pH < 5.5	99,000	7,700	**10,400**	**16,200**	**23,600**	**10,400**	**4,200**	**9,950**	**13,400***
Arsenic	5.54	18.0	1.6	0.39	**20.9 J**	**9.6 J**	**14.4 J**	**6.8 J**	**2 L**	**4 L**	**5.4 L**
Barium	84.5	330	19,000	1,500	**15.3 J**	**24.5**	**35.9**	**13.5 J**	**16.4 K**	**28.8 K**	**25.4 K**
Beryllium	0.52	40.0	200	16	**0.73**	**0.4 J**	**0.67**	**0.48 J**	**0.37 J**	**0.34 J**	**0.42**
Cadmium	--	32.0	80	7	**0.02 J**	0.57 U	0.9 U	**0.11 J**	0.38 U	0.48 U	0.35 U
Calcium	2,380	--	--	--	**578**	**910**	**1,340**	**578**	**104 J**	**1,120**	**482**
Chromium	33.7	64.0	5.6	0.29	**34.4 L**	**23.6 L**	**36.3 L**	**19.7 L**	**5.2**	**12.5**	**16.3**
Cobalt	5.18	13.0	30	2.3	**3.3 J**	**3.5 J**	**5 J**	**2.5 J**	**2.4 J**	**1.8 J**	**2.6 J**
Copper	3.17	70.0	4,100	310	**4.3**	**4.6**	**8.1**	**3.9**	1.5 B	2.7 B	4.8 B
Cyanide	2.7	15.8	2,000	160	0.55 U	0.65 U	0.6 U	0.55 U	0.5 U	0.55 U	**0.54 J**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**34,700 J**	**15,400 J**	**25,700 J**	**17,800 J**	**3,460**	**8,260**	**11,900**
Lead	8.79	120	800	400	**25 J**	**10.8 J**	**16.6 J**	**6.9 J**	**4.1**	**8.7**	**35.4**
Magnesium	1,120	--	--	--	**678 J**	**933**	**1,410**	**776**	**332 J**	**591**	**855**
Manganese	176	220	2,300	180	**108**	**31**	**37.4**	**26.5**	**31.8 L**	**36.9 L**	**39.4 L**
Mercury	0.14	0.10	31	2.3	0.11 UL	0.14 UL	0.11 UL	0.1 UL	0.12 UL	0.086 UL	**0.05 L**
Nickel	17.6	38.0	2,000	150	**7.2**	**8.3**	**17.2**	**5.6**	**3.3**	**5.2**	**7**
Potassium	901	--	--	--	**821**	**984**	**1,630**	**1,010**	**203 J**	**507 J**	**687 J**
Selenium	0.64	0.52	510	39	**1.4 J**	**0.64 J**	**1.6 J**	**0.62 J**	2.7 U	**0.4 J**	**0.41 J**
Sodium	811	--	--	--	**29.5 J**	**40.9 J**	**60.6 J**	**33.8 J**	15.2 B	33.2 B	25.8 B
Thallium	--	1.00	1[1]	.078[1]	4.2 U	2.8 U	4.5 U	**0.07 J**	1.9 U	0.12 B	0.11 B
Vanadium	48.3	130	520	39	**32.6**	**33.4**	**54.2**	**28.3**	**6.9**	**19.1**	**23.9**
Zinc	28	120	31,000	2,300	**24**	**24.7**	**34.6**	**19.7**	**7.6 K**	**16.2 K**	**20.8 K**
Wet Chemistry											
% Solids (pct)	--	--	--	--	**87**	**74**	**86**	**91**	**84**	**89**	**89**
pH (ph)	--	--	--	--	**6**	**5.7**	**6.1**	**6.1**	**5.8**	**6.8**	**5.3**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**2,600 J**	**3,200 J**	**2,200 J**	**2,500 J**	**4,700**	**12,000**	**5,600**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection
[1]Adjusted June 2011 RSL value
*Eco exceedance due to pH value
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 5-9
AOC 6 Groundwater Detection and Exceedance Results; TNT Graining House and Catch Box Ruins Subarea
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW YE AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Nov. 2010)**	**CLEAN RSLs Tapwater Adjusted (Nov. 2010)**	CAA06-DW01	CAA06-DW06	CAA06-DW07	CAA06-DW08
Sample ID					CAA06-DW01-1108	CAA06-DW06-1108	CAA06-DW07-1108	CAA06-DW08-1108
Sample Date					11/05/08	11/10/08	11/10/08	11/10/08
Chemical Name								
Semivolatile Organic Compounds (UG/L)								
No Detections								
Explosives (UG/L)								
No Detections								
Total Metals (UG/L)								
Aluminum	2,230	87.0	--	3,700	**2,170**	**30,600**	**35,100**	**1,730**
Antimony	18.8	30.0	6	1.5	60 R	60 U	**0.78 J**	60 U
Arsenic	2.28	150	10	0.045	**76.2**	**83.2**	**163**	**36.5**
Barium	118	4.00	2,000	730	**20.2 J**	**50 J**	**89.1 J**	**13 J**
Beryllium	2.45	0.66	4	7.3	**0.29 J**	**2.7 J**	**4.8 J**	5 U
Calcium	169,000	--	--	--	**46,800**	**39,400**	**56,100**	**45,200**
Chromium	15.1	11.4	100	0.043	8.6 B	**149**	**152**	**5 J**
Cobalt	20.6	23.0	--	1.1	**6 J**	**13.7 J**	**22.2 J**	**0.53 J**
Copper	12.2	9.33	1,300	150	7.4 B	**44.4**	**43.4**	**6 J**
Iron	894	1,000	--	2,600	**34,000**	**126,000**	**230,000**	**24,800**
Lead	21.3	3.18	15	--	4.7 B	**70.2**	**71.8**	**3.3 J**
Magnesium	11,500	--	--	--	**2,890 J**	**5,810**	**7,260**	**2,870 J**
Manganese	57.9	120	--	88	**239**	**368**	**701**	**457**
Mercury	0.081	0.91	2	1.1	0.2 U	**0.03 J**	**0.04 J**	0.2 U
Nickel	11.4	52.2	--	73	5.3 B	**61.6**	**62.5**	3.4 B
Potassium	12,700	--	--	--	**3,170 J**	**8,020**	**9,130**	**2,930 J**
Selenium	--	5.00	50	18	35 U	35 U	**2.1 J**	35 U
Silver	--	0.36	--	18	0.4 B	**2.2 J**	**5 J**	**0.77 J**
Sodium	64,500	--	--	--	**11,200**	**10,600**	**11,200**	**11,700**
Vanadium	26.2	20.0	--	18	**8.1 J**	**107**	**155**	**3.6 J**
Zinc	4.52	120	--	1,100	15.1 B	**205**	**194**	**8.9 J**
Dissolved Metals (UG/L)								
Aluminum, Dissolved	100	87.0	--	3,700	**127 J**	68.5 B	**4,080**	71.4 B
Arsenic, Dissolved	1.37	150	10	0.045	**74.6**	**38.5**	**62.2**	**35.4**
Barium, Dissolved	127	4.00	2,000	730	**16.1 J**	**8.2 J**	**27.4 J**	**9.6 J**
Beryllium, Dissolved	--	0.66	4	7.3	5 U	5 U	**0.63 J**	5 U
Calcium, Dissolved	113,000	--	--	--	**48,900**	**40,600**	**54,100**	**46,700**
Chromium, Dissolved	6.04	11.0	100	0.043	10 U	10 U	**17.1**	10 U
Cobalt, Dissolved	0.7	23.0	--	1.1	**1.8 J**	**0.97 J**	**2.4 J**	50 U
Copper, Dissolved	3	8.96	1,300	150	25 U	25 U	**9.9 J**	25 U
Iron, Dissolved	275	1,000	--	2,600	**25,400**	**19,500**	**46,500**	**23,100**
Lead, Dissolved	1.7	2.52	15	--	**1 J**	10 U	**9.8 J**	10 U
Magnesium, Dissolved	11,200	--	--	--	**2,780 J**	**2,290 J**	**3,480 J**	**2,810 J**
Manganese, Dissolved	49.5	120	--	88	**237**	**259**	**480**	**467**
Nickel, Dissolved	12.2	52.0	--	73	2.4 B	**4.3 J**	**8.5 J**	1.1 B
Potassium, Dissolved	12,600	--	--	--	**3,040 J**	**2,830 J**	**3,920 J**	**2,690 J**
Silver, Dissolved	--	0.36	--	18	0.6 B	**0.76 J**	**1.2 J**	**0.8 J**

TABLE 5-9

AOC 6 Groundwater Detection and Exceedance Results; TNT Graining House and Catch Box Ruins Subarea

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW YE AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Nov. 2010)**	**CLEAN RSLs Tapwater Adjusted (Nov. 2010)**	CAA06-DW01	CAA06-DW06	CAA06-DW07	CAA06-DW08
Sample ID					CAA06-DW01-1108	CAA06-DW06-1108	CAA06-DW07-1108	CAA06-DW08-1108
Sample Date					11/05/08	11/10/08	11/10/08	11/10/08
Chemical Name								
Sodium, Dissolved	62,800	--	--	--	**11,100**	**11,400**	**11,200**	**12,200**
Thallium, Dissolved	--	12.0	2	0.037[1]	1.8 B	25 U	**1.7 J**	25 U
Vanadium, Dissolved	4.3	20.0	--	18	50 U	50 U	**17.2 J**	50 U
Zinc, Dissolved	--	118	--	1,100	5 B	**6 J**	**26.2 J**	**5.1 J**

Notes:

Exceeds Background

Exceeds BKG & ECO

Exceeds BKG & Tapwater RSL

Exceeds BKG, Tapwater RSL & MCL

Exceeds BKG, ECO & Tapwater RSL

Exceeds BKG, ECO & MCL

Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

[1]Adjusted June 2011 RSL value

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - Analyte not detected

UG/L - Micrograms per liter

TABLE 5-10

AOC 6 Surface Water Detection and Exceedance Results

Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8

Cheatham Annex

Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	**CLEAN RSLs Tap X 10 for SW Adjusted (Nov. 2010)**	CAA06-SW01		CAA06-SW02
Sample ID			CAA06-SW01-1008	CAA06-SW01P-1008	CAA06-SW02-1008
Sample Date			10/23/08	10/23/08	10/23/08
Chemical Name					
Semivolatile Organic Compounds (UG/L)					
bis(2-Ethylhexyl)phthalate	32.0	48	**2.1 J**	10 U	10 U
Di-n-octylphthalate	22.0	--	10 U	10 U	**2.2 J**
Explosives (UG/L)					
RDX	186	6.1	**0.16 J**	0.4 U	0.4 U
Total Metals (UG/L)					
Barium	4.00	7,300	**19.6 J**	**19 J**	**19.8 J**
Calcium	--	--	**30,800**	**30,800**	**31,500**
Iron	1,000	26,000	**240**	**241**	**279**
Magnesium	--	--	**1,870 J**	**1,860 J**	**1,900 J**
Manganese	120	880	**37.4**	**37.1**	**38.6**
Potassium	--	--	**2,880 J**	**2,840 J**	**2,990 J**
Sodium	--	--	**11,500**	**11,700**	**11,900**
Thallium	12.0	0.37[1]	**1.7 J**	25 U	25 U
Vanadium	20.0	180	50 U	50 U	**0.41 J**
Zinc	105	11,000	**3.4 J**	**3 J**	**3.4 J**
Dissolved Metals (UG/L)					
Aluminum, Dissolved	87.0	37,000	**55.4 J**	**36 J**	**52.8 J**
Barium, Dissolved	4.00	7,300	**17.5 J**	**17.8 J**	**15.9 J**
Calcium, Dissolved	--	--	**30,500**	**30,700**	**29,700**
Copper, Dissolved	7.83	1,500	25 U	25 U	**0.78 J**
Iron, Dissolved	1,000	26,000	**35.4 J**	**31.8 J**	**34.3 J**
Magnesium, Dissolved	--	--	**1,830 J**	**1,850 J**	**1,760 J**
Nickel, Dissolved	45.6	730	**0.52 J**	**0.6 J**	**0.45 J**
Potassium, Dissolved	--	--	**2,720 J**	**2,800 J**	**2,700 J**
Sodium, Dissolved	--	--	**11,700**	**11,800**	**11,700**
Vanadium, Dissolved	20.0	180	50 U	**0.46 J**	**0.41 J**
Zinc, Dissolved	103	11,000	**2.8 J**	**2.9 J**	**2.4 J**
Wet Chemistry					
Hardness (ug/l)	--	--	**84,600**	NA	**86,400**

Notes:

Exceeds ECO

Exceeds Tapwater RSL

Bold indicates detection

[1]Adjusted June 2011 Tapwater RSL

-- - No value available

NA - Not analyzed

J - Analyte present, value may or may not be accurate or precise

U - Analyte not detected

UG/L - Micrograms per liter

TABLE 5-11
AOC 6 Sediment Detection and Exceedance Results
Site Inspection Report: AOC 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Sediment Screening Value - Fresh**	**CLEAN RSLs Res Soil X 10 for SD Adjusted (Nov. 2010)**	CAA06-SD01			CAA06-SD02	
Sample ID			CAA06-SD01-1008	CAA06-SD01P-1008	CAA06-SSD01-1008	CAA06-SD02-1008	CAA06-SSD02-1008
Sample Date			10/23/08	10/23/08	10/23/08	10/23/08	10/23/08
Depth			0-4"	0-4"	4-8"	0-4"	4-8"
Chemical Name							
Semivolatile Organic Compounds (UG/KG)							
2,6-Dinitrotoluene	187[1]	61,000	99 U	100 U	100 U	100 U	**260**
bis(2-Ethylhexyl)phthalate	4,094,000[1]	350,000	**3,300 J**	480 UJ	680 U	480 U	600 U
Di-n-octylphthalate	50,600[1]	--	**2,500 J**	480 UJ	680 UJ	480 UJ	600 UJ
Explosives (UG/KG)							
2,4,6-Trinitrotoluene	--	36,000	99 U	100 U	100 U	100 U	**150**
4-Amino-2,6-dinitrotoluene	107[1]	150,000	99 U	**110**	100 U	100 U	100 U
Total Metals (MG/KG)							
Aluminum	25,500	77,000	**2,200 J**	**626 J**	**1,690**	**1,460**	**5,760**
Antimony	3.00	31	**0.17 L**	**0.06 L**	**0.18 L**	4.8 UL	4.8 UL
Arsenic	9.79	3.9	**12.1 J**	**3.7 J**	**6.9 J**	**1.2 J**	**4.6 J**
Barium	20.0	15,000	**9.4 J**	**2.9 J**	**8.3 J**	**4.1 J**	**16.4**
Beryllium	--	160	**0.18 J**	**0.06 J**	**0.12 J**	**0.07 J**	**0.19 J**
Calcium	--	--	**1,680 J**	**510 J**	**2,780**	**614**	**2,960**
Chromium	43.4	2.9	**5 J**	**1.8 J**	**2.9 J**	**2.9 J**	**7.6 J**
Cobalt	50.0	23	**0.67 J**	**0.2 J**	**0.49 J**	**0.35 J**	**1.2 J**
Copper	31.6	3,100	3.5 B	0.98 B	**2.7**	1.3 B	**4**
Iron	20,000	55,000	**4,840 J**	**1,920 J**	**3,610 J**	**1,820 J**	**4,740 J**
Lead	35.8	4,000	**11 J**	**6.8 J**	**6.4 J**	**2.9 J**	**11.5 J**
Magnesium	--	--	**206 J**	**59.2 J**	**174 J**	**109 J**	**416**
Manganese	460	1,800	**37.1**	**13.6**	**38.1**	**15.2**	**53.2**
Nickel	22.7	1,500	**1.7 J**	**0.56 J**	**1.3 J**	**0.88 J**	**3.3**
Potassium	--	--	**195 J**	**68.7 J**	**137 J**	**99 J**	**293 J**
Sodium	--	--	**29.2 J**	**7.8 J**	**28.6 J**	**10.7 J**	**38.4 J**
Vanadium	57.0	390	**5.9 J**	**2.2 J**	**4.4 J**	**3.8 J**	**10.2 J**
Zinc	121	23,000	**12.1**	**3.5 J**	**10**	**6.9**	**28.9**
Acid Volatile Sulfide/Simultaneously Extractable Metals (MG/KG)							
Cadmium, SEM	--	--	**7.90E-04 J**	**1.80E-04 J**	**3.20E-04 J**	**1.10E-04 J**	**3.40E-04 J**
Copper, SEM	--	--	**0.0250 L**	**0.0101 L**	**0.0121 L**	0.00536 B	**0.0124 L**
Lead, SEM	--	--	**0.0420 J**	**0.0109 J**	**0.0229**	**0.00871**	**0.0216**
Nickel, SEM	--	--	**0.0093 J**	0.00248 B	0.00313 B	0.00139 B	0.00368 B
Zinc, SEM	--	--	**0.204 J**	**0.0388 J**	**0.0645**	**0.0277**	**0.0863**
AVSSEM (UMOL/G)							
Acid volatile sulfide	--	--	**13 L**	**1.4 L**	**5.1 L**	0.15 UL	**3 L**
Wet Chemistry							
% Solids (pct)	--	--	**28**	**69**	**48**	**68**	**55**
pH (ph)	--	--	**7.6**	NA	**7.4**	**7.8**	**7.3**
Total organic carbon (TOC) (ug/g)	--	--	**69,000 K**	NA	**36,000 K**	**23,000 K**	**31,000 K**

TABLE 5-11
AOC 6 Sediment Detection and Exceedance Results
Site Inspection Report: AOC 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Sediment Screening Value - Fresh**	**CLEAN RSLs Res Soil X 10 for SD Adjusted (Nov. 2010)**	CAA06-SD01			CAA06-SD02	
Sample ID			CAA06-SD01-1008	CAA06-SD01P-1008	CAA06-SSD01-1008	CAA06-SD02-1008	CAA06-SSD02-1008
Sample Date			10/23/08	10/23/08	10/23/08	10/23/08	10/23/08
Depth			0-4"	0-4"	4-8"	0-4"	4-8"
Chemical Name							
Grain Size (PCT)							
Coarse Sand (%)	--	--	**2.3**	NA	**2.2**	**1.4**	**4.7**
Fine Sand (%)	--	--	**34.2**	NA	**57.1**	**44.8**	**48.8**
Fines (%)	--	--	**48.6**	NA	**19.9**	**16.8**	**0.4**
Gravel (%)	--	--	**4.3**	NA	**3.7**	**2.9**	**6.3**
GS03 Sieve 3" (75 mm)	--	--	**100**	NA	**100**	**100**	**100**
GS05 Sieve 2" (50 mm)	--	--	**100**	NA	**100**	**100**	**100**
GS06 Sieve 1.5" (37.5 mm)	--	--	**100**	NA	**100**	**100**	**100**
GS07 Sieve 1" (25.0 mm)	--	--	**100**	NA	**100**	**100**	**100**
GS08 Sieve 0.75" (19.0 mm)	--	--	**100**	NA	**100**	**99.4**	**100**
GS10 Sieve 0.375" (9.5 mm)	--	--	**97.9**	NA	**98.6**	**98.8**	**97.2**
Medium Sand (%)	--	--	**10.6**	NA	**17.1**	**34**	**39.7**
Sieve No. 004 (4.75 mm)	--	--	**95.7**	NA	**96.3**	**97.1**	**93.7**
Sieve No. 010 (2.00 mm)	--	--	**93.4**	NA	**94.1**	**95.7**	**89**
Sieve No. 020 (850 um)	--	--	**91.7**	NA	**92**	**90.7**	**81.4**
Sieve No. 040 (425 um)	--	--	**82.8**	NA	**76.9**	**61.7**	**49.3**
Sieve No. 060 (250 um)	--	--	**67.2**	NA	**52.9**	**35**	**23**
Sieve No. 100 (150 um)	--	--	**56.5**	NA	**33.8**	**24.5**	**12.4**
Sieve No. 140 (106 um)	--	--	**59.9**	NA	**40.2**	**27.4**	**15.5**
Sieve No. 200 (75 um)	--	--	**48.6**	NA	**19.9**	**16.8**	**0.4**

Notes:

Exceeds Eco

Exceeds Res RSL

Exceeds Eco & Res RSL

Bold indicates detections

[1]Equilibrium Partitioning Value used as eco screening value. See Tables B-41 and B-43 in Appendix B

-- - No value available

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 5-12
AOC 6 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Background or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
AOC 6 - 1918 Drum Storage Area Surface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	No. The potential HH risk to groundwater is based on total inorganics; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum and thallium were the only inorganics detected in the dissolved fraction. Aluminum is likely attributable to background and the one detection of dissolved thallium is within one order of magnitude of the unadjusted Tapwater RSL; therefore, no unacceptable human health risk above background is expected and no further action is recommended for all media for this subarea of AOC 6. (A consensus letter will be prepared for CAX Partnering Team review to capture the NFA recommendation, including a risk assessment using existing data.)
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 2 inorganics (Al [potential HH and eco risks]; Pb [potential eco risk])	No, based on results of HH and eco risk screenings	
AOC 6 - 1918 Drum Storage Area Subsurface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 2 inorganic (Al, Th - potential HH risk only)	No, based on results of HH risk screening	
AOC 6 - 1918 Drum Storage Area Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 16 total inorganics (As, Th - potential HH risk; Al, Be, Cd, Cr, Co, Fe, Pb, Mn, Ni, V - potential HH and eco risks; Ba, Cu, Se, Zn - potential eco risk) and 2 dissolved inorganics (Th - HH qualitative review only[1]; Al - potential eco risk)	Yes - 11 total irorganics (Al, As, Be, Cd, Cr, Co, Fe, Pb, Mn, Th, V - potential HH risk only)	
AOC 6 - Ammonia Settling Pits Surface Soil	Yes	SVOCs	Yes	Yes - 3 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene - potential HH risk only)	No, based on results of HH risk screening	Yes - An ESI is recommended to install permanent monitoring wells and confirm potential groundwater inorganic constituent contamination and and verify the groundwater flow direction.
		Explosives	Yes	Yes - 1 explosive (HMX - potential eco risk only). Also, 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 1 inorganic (Hg - potential eco risk only)	No, based on results of eco risk screening	
AOC 6 - Ammonia Settling Pits Subsurface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	Yes	No; however, 1,3,5-trinitrobenzene was identified as an initial eco COPC since no screening value was available	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 1 inorganic (Al - potential HH and eco risk)	No, based on results of HH and eco risk screenings	
AOC 6 - Ammonia Settling Pits Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 11 total inorganics (As - potential HH risk; Al, Cr, Co, Fe, Pb, Mn, V - potential HH and eco risks; Cd, Ni, Zn - potential eco risk) and 4 dissolved inorganics (As - HH qualitative review only[1]; Co, Fe, Mn - HH qualitative review[1] and potential eco risk)	Yes - 6 total inorganics (Al, As, Cr, Co, Fe, Mn - potential HH risk) and 2 dissolved inorganics (Fe, Mn - potential eco risk)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Surface Soil	Yes	SVOCs	Yes	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only). Also, benzaldehyde was identified as an initial eco COPC since no screening value was available	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only)	Yes - An RI is recommended to characterize the nature and extent of contamination and conduct quantitative risk assessments. Permanent monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for SVOCs, explosives and inorganics, plus include a few chromium speciation analyses. It is recommended groundwater samples are analyzed for inorganics (total and dissolved).
		Explosives	Yes	Yes - 6 explosives (1,3-dinitrobenzene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, 4-amino-2,6-dinitrotoluene [potential HH risks]; 2,4,6-trinitrotoluene [potential HH and eco risks]). Also, 1,3-dinitrobenzene, 1,3,5-trinitrobenzene, 2-nitrotoluene, and 3,5-dinitroaniline were identified as initial eco COPCs since no screening values were available	Yes - 2 explosives (2,4,6-trinitrotoluene, 2-nitrotoluene - potential HH and eco risks)	
		Inorganics	Yes	Yes - 10 inorganics (Al, Fe, Pb - potential HH and eco risks; As, Cr, Th, V - potential HH risk; Hg, Se, Zn - potential eco risk)	Yes - 3 inorganics (As, Cr - potential HH risk only; Se - potential eco risk only)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Subsurface Soil	Yes	SVOCs	Yes	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH and eco risks)	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only)	
		Explosives	Yes	Yes - 3 explosives (1,3-dinitrobenzene, 4-amino-2,6-dinitrotoluene - potential HH risk only; 2,4,6-trinitrotoluene - potential HH and eco risks] Also, 1,3-dinitrobenzene and 3,5-dinitroaniline were identified as initial eco COPCs since no screening values were available	Yes - 1 explosive (2,4,6-trinitrotoluene - potential HH and eco risks)	
		Inorganics	Yes	Yes - 7 inorganics (Cr, Fe, Th, V - potential HH risk; Al, As - potential HH and eco risks; Se - potential eco risk)	Yes - 3 inorganics (As, Cr - potential HH risk only; Se - potential eco risk only)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 13 total inorganics (Th - potential HH risk; Al, As, Be, Cr, Co, Fe, Pb, Mn, V - potential HH and eco risks; Ni, Ag, Zn - potential eco risk) and 10 dissolved inorganics (As, Co, Th - HH qualitative review only[1]; Al, Cr, Fe, Mn - HH qualitative review[1] and potential eco risk ; Cu, Pb, Ag - potential eco risk)	Yes - 9 total inorganics (Al, As, Be, Cr, Co, Fe, Pb, Mn, V - potential HH risk only) and 2 dissolved inorganics (Al, Fe - potential eco risk only)	

[1]Although total (unfiltered) and dissolved (filtered) groundwater samples were collected, only total sample data were analyzed in the human health risk screening evaluation; analytical data from the dissolved groundwater samples were reviewed for qualitative purposes only.

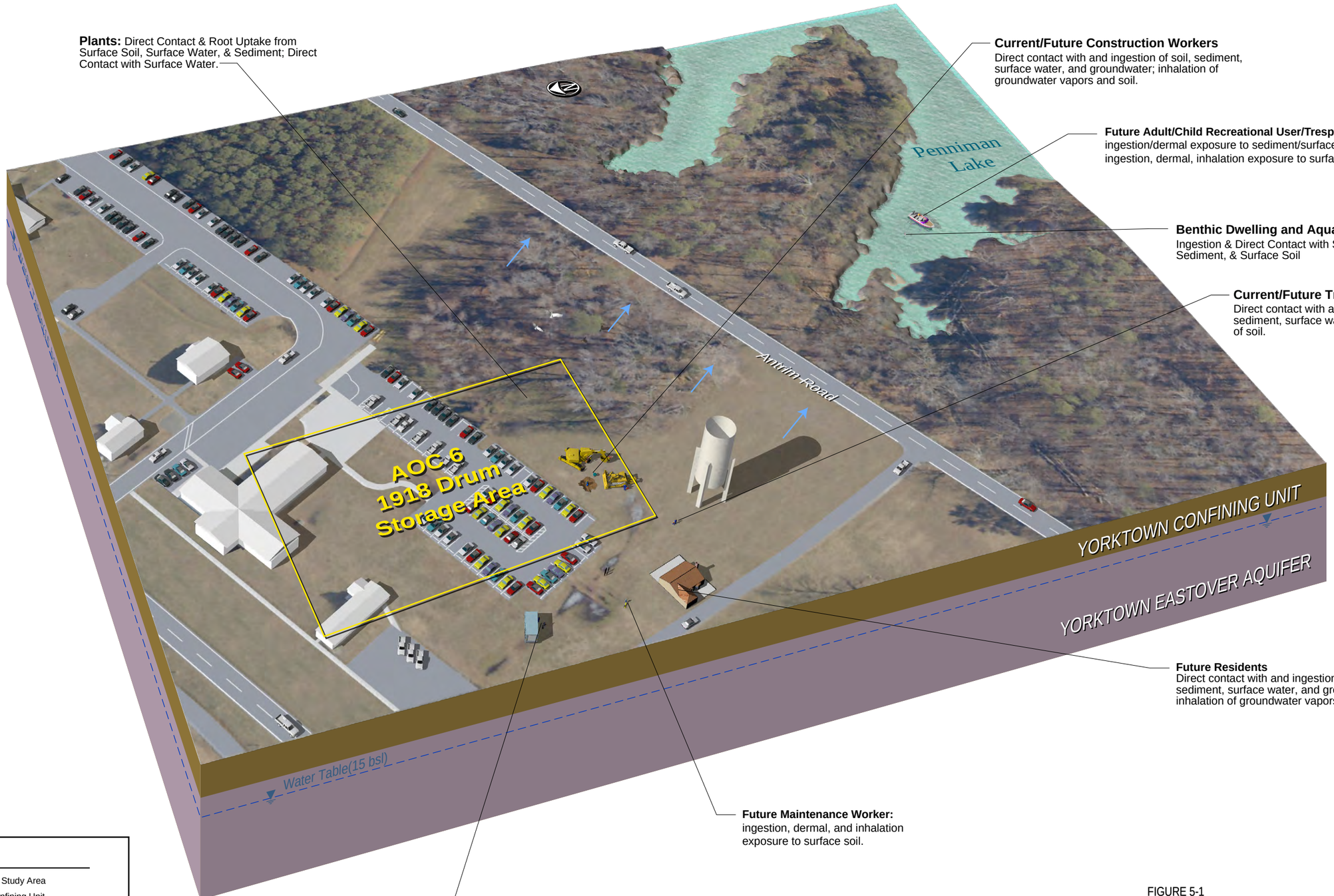
Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 5-12
AOC 6 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Background or Non-inorganics Detected?	Step 1 Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
Penniman Lake Surface Water Adjacent to AOC 6	Yes	SVOCs	Yes	No; however, di-n-octylphthalate was identified as an initial HH COPC since no screening value was available	No, based on results of HH risk screening	No
		Explosives	Yes	No	N/A	
		Inorganics	Yes	Yes - 2 total inorganics (Th - potential HH risk only; Ba - potential eco risk only) and 1 dissolved inorganic (Ba - potential eco risk only)	No, based on results of the HH and eco risk screenings	
Penniman Lake Surface Sediment Adjacent to AOC 6	Yes	SVOCs	Yes	No; however, di-n-octylphthalate was identified as an initial HH COPC since no screening value was available	No, based on results of HH risk screening	
		Explosives	Yes	Yes - 1 explosive (4-amino-2,6-dinitrotoluene - potential eco risk only)	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 2 inorganics (Cr - potential HH risk; As - potential HH and eco risks); Also, Be was identified as an initial eco COPC since no screening value was available	No, based on results of HH and eco risk screenings	
Penniman Lake Subsurface Sediment Adjacent to AOC 6	Yes	SVOCs	Yes	Yes - 1 SVOC (2,6-dinitrotoluene - potential eco risk)	No, based on results of eco risk screening	
		Explosives	Yes	No	N/A	
		Inorganics	Yes	Yes - 2 inorganics (As, Cr - HH risk) Also, Be was identified as an initial eco COPC since no screening value was available	No, based on results of HH and eco risk screenings	

[a]Although total (unfiltered) and dissolved (filtered) groundwater samples were collected, only total sample data were analyzed in the human health risk screening evaluation; analytical data from the dissolved groundwater samples were reviewed for qualitative purposes only.

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern



Plants: Direct Contact & Root Uptake from Surface Soil, Surface Water, & Sediment; Direct Contact with Surface Water.

Current/Future Construction Workers
Direct contact with and ingestion of soil, sediment, surface water, and groundwater; inhalation of groundwater vapors and soil.

Future Adult/Child Recreational User/Trespasser:
ingestion/dermal exposure to sediment/surface water and ingestion, dermal, inhalation exposure to surface soil.

Benthic Dwelling and Aquatic Organisms:
Ingestion & Direct Contact with Surface Water, Sediment, & Surface Soil

Current/Future Trespassers
Direct contact with and ingestion of soil, sediment, surface water and inhalation of soil.

Future Residents
Direct contact with and ingestion of soil, sediment, surface water, and groundwater; inhalation of groundwater vapors and soil.

Future Maintenance Worker:
ingestion, dermal, and inhalation exposure to surface soil.

Current/Future Base Workers
Direct contact with and ingestion of soil, sediment, and surface water.

LEGEND

- Approximate Study Area
- Yorktown Confining Unit
- Yorktown Eastover Aquifer
- Anticipated Surface Water Flow Direction
- Water Table

FIGURE 5-1
AOC 6 Conceptual Site Model
1918 Drum Storage Area
Site Inspection Report Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex,
Williamsburg, Virginia

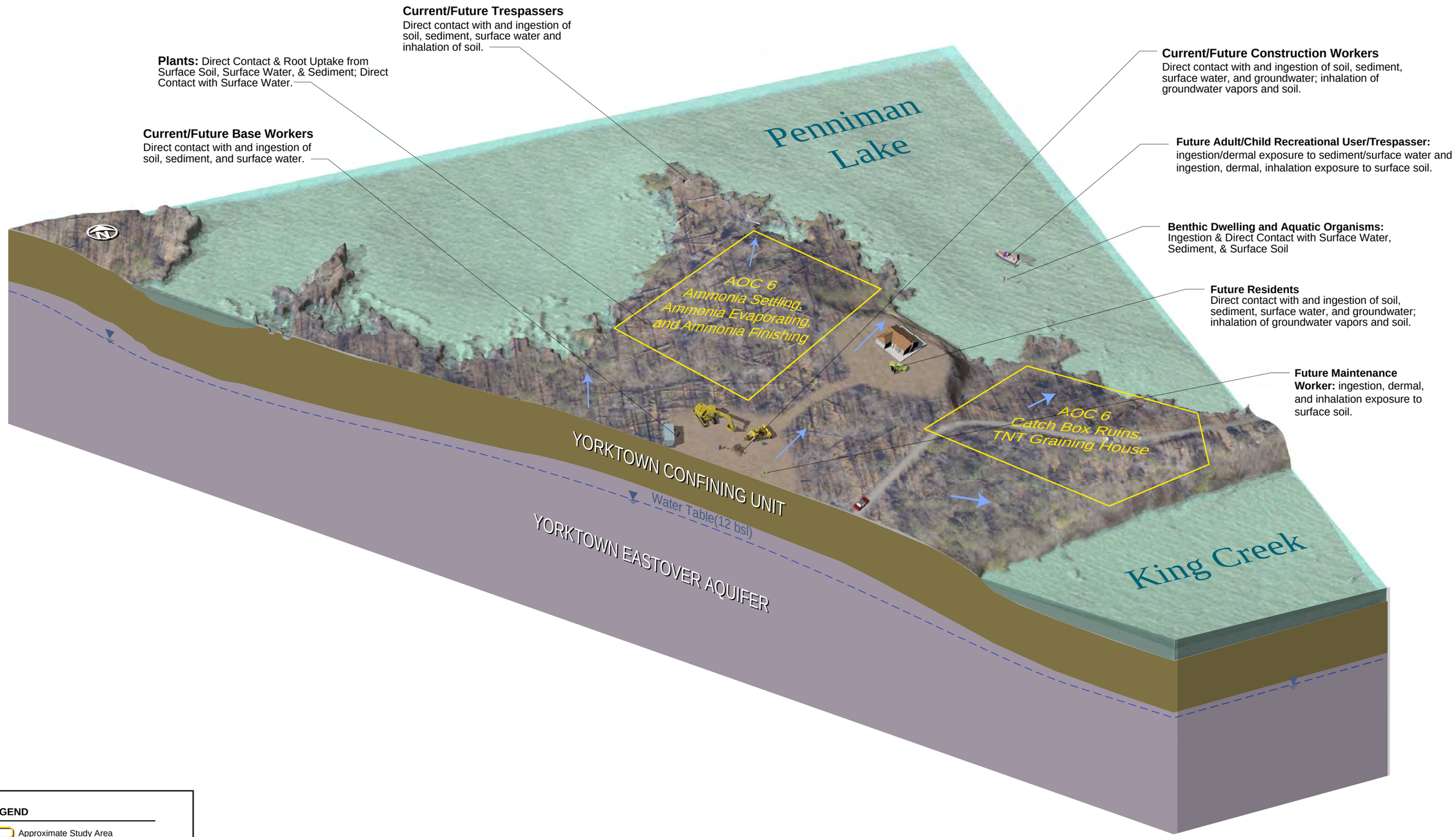


FIGURE 5-2
AOC 6 Conceptual Site Model
Ammonia Settling Area, Catch Box Ruins and TNT Graining House
Site Inspection Report Areas of Concern 1,2,6,7, and 8
Cheatham Annex,
Williamsburg, Virginia

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-3_AOC6 SUBAREA.MXD MUNWIN 4/14/11

Legend

Approximate Study Area Boundary

CAX Boundary / Fenceline

N
W E
S

0 300 600 Feet

Figure 5-3
AOC 6 Subarea Location Map
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-4_AOC 6 1918 DRUM STORAGE.MXD BHATHAWA 2/21/2012 3:50:03 PM

Legend

- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs
- Topographic Surface Contour (feet above mean sea level)

N
W E
S

0 40 80
Feet

Figure 5-4
AOC 6 Site Map; 1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-5_AOC6_TNT_AREA.MXD MUNWIN 4/14/11

Legend

- Approximate AOC 6 Study Areas
- Buildings
- Topographic Surface Contour (feet above mean sea level)

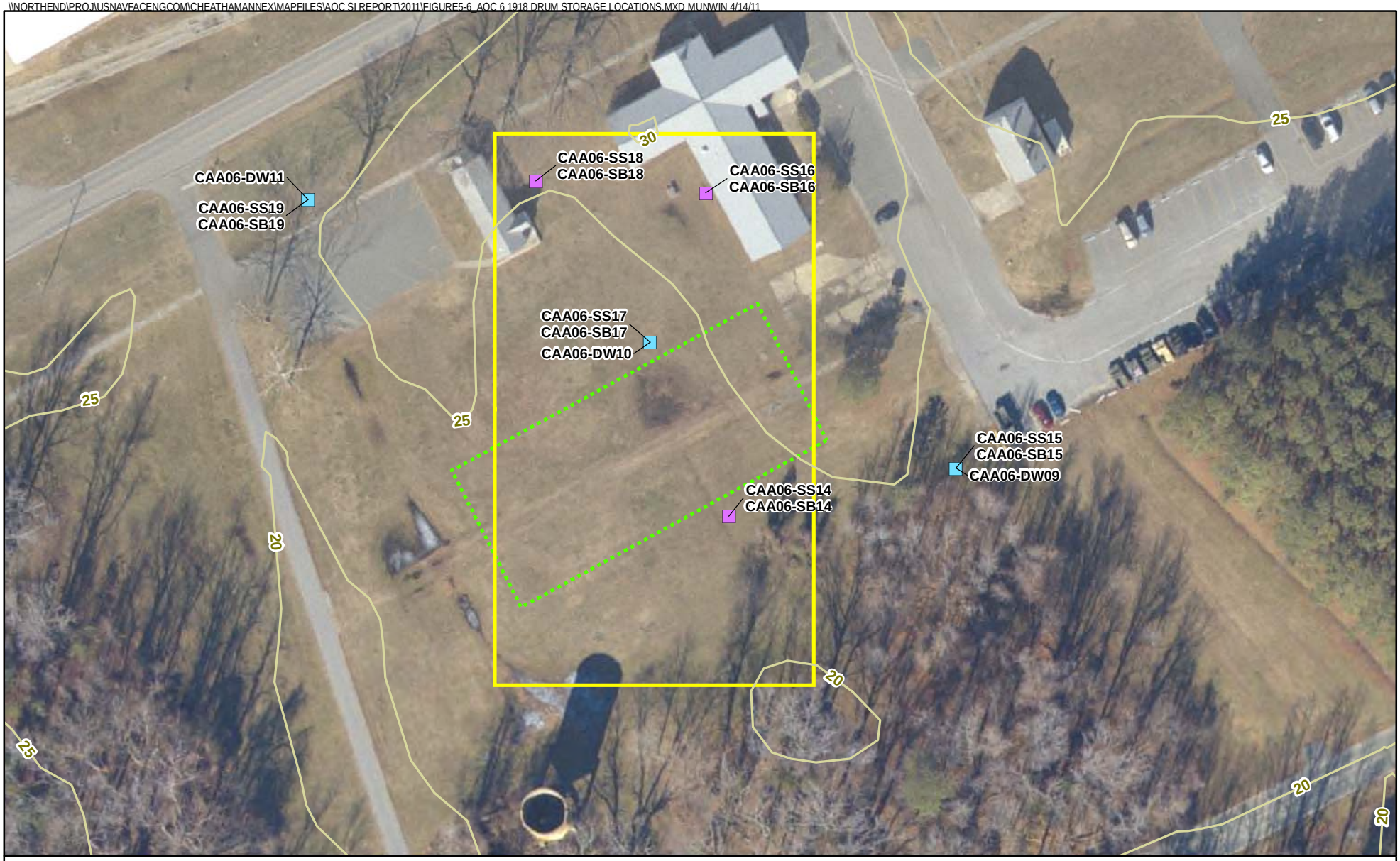
N
W E
S

0 50 100 150 200
Feet

Figure 5-5
AOC 6 Site Map; Ammonia Settling Pit, TNT Graining House and Catch Box Ruins Subareas
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-6_AOC 6 1918 DRUM STORAGE LOCATIONS.MXD MUNWIN 4/14/11



Legend

- Groundwater/Soil Sample Location
- Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Topographic Surface Contour (feet above mean sea level)

N
W E
S

0 40 80
Feet

Figure 5-6
AOC 6 Comprehensive Investigation Locations
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-7_AOC6_TNT_AREA_LOCATIONS.MXD BHATHAWA 10/7/2011 4:05:46 PM

Legend

- Groundwater/Soil Sample Location
- Soil Sample Location
- Surface Water/Sediment Sample Location
- Approximate AOC 6 Study Areas
- Buildings
- Topographic Surface Contour (feet above mean sea level)

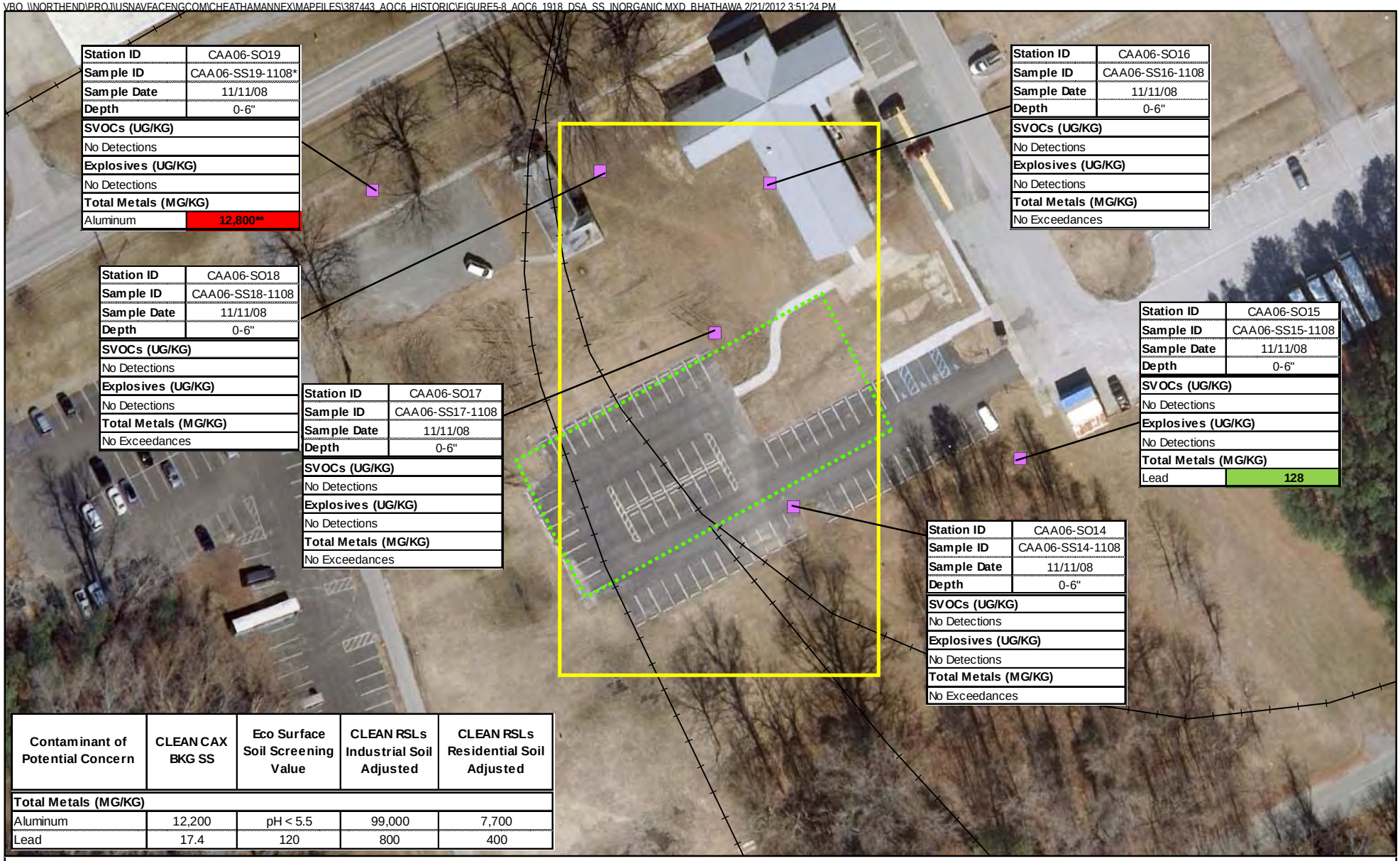
N
W E
S

0 50 100
Feet

Figure 5-7
AOC 6 Comprehensive Investigation Locations; Ammonia Settling Pit, TNT Graining House and Catch Box Ruins Subareas
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-8_AOC6_1918_DSA_SS_INORGANIC.MXD BHATHAWA 2/21/2012 3:51:24 PM



Station ID	CAA06-SO19
Sample ID	CAA06-SS19-1108*
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
Aluminum	12,800**

Station ID	CAA06-SO16
Sample ID	CAA06-SS16-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO18
Sample ID	CAA06-SS18-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO17
Sample ID	CAA06-SS17-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO15
Sample ID	CAA06-SS15-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
Lead	128

Station ID	CAA06-SO14
Sample ID	CAA06-SS14-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Lead	17.4	120	800	400

Legend

- Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs

Notes:

Exceeds BKG & ECO

Exceeds BKG, ECO & Res RSL

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

**Eco exceedance due to pH value

-- - No value available

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

N W E S

0 40 80 Feet

Figure 5-8
AOC 6 Surface Soil Exceedance Results
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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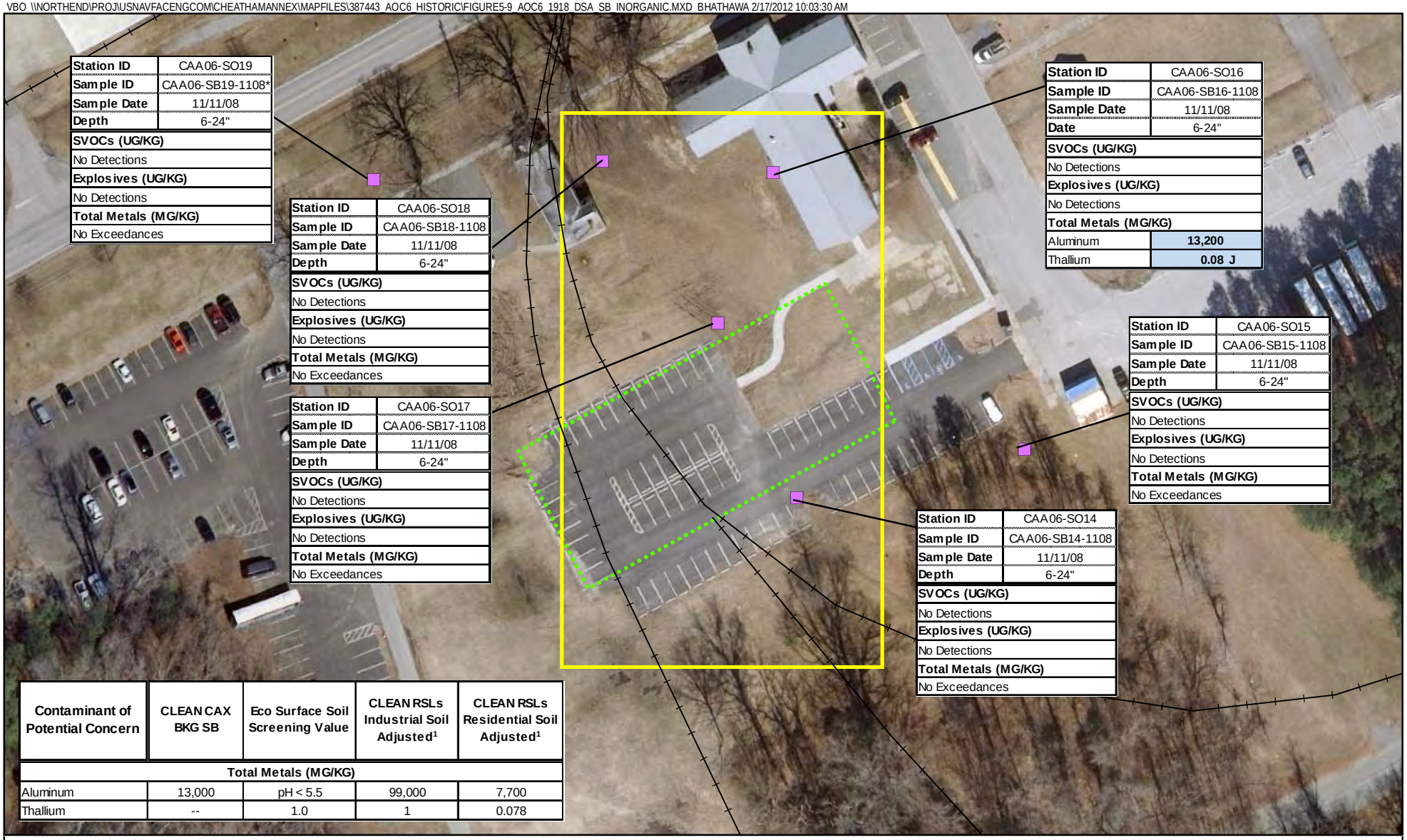
VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-9_AOC6_1918_DSA_SB_INORGANIC.MXD BHATHAWA 2/17/2012 10:03:30 AM



Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted[1]	CLEAN RSLs Residential Soil Adjusted[1]
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Thallium	--	1.0	1	0.078

Legend

- Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs

Notes:

Exceeds BKG and Res RSL

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

[1] Adjusted June 2011 RSL value

-- - No value available

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

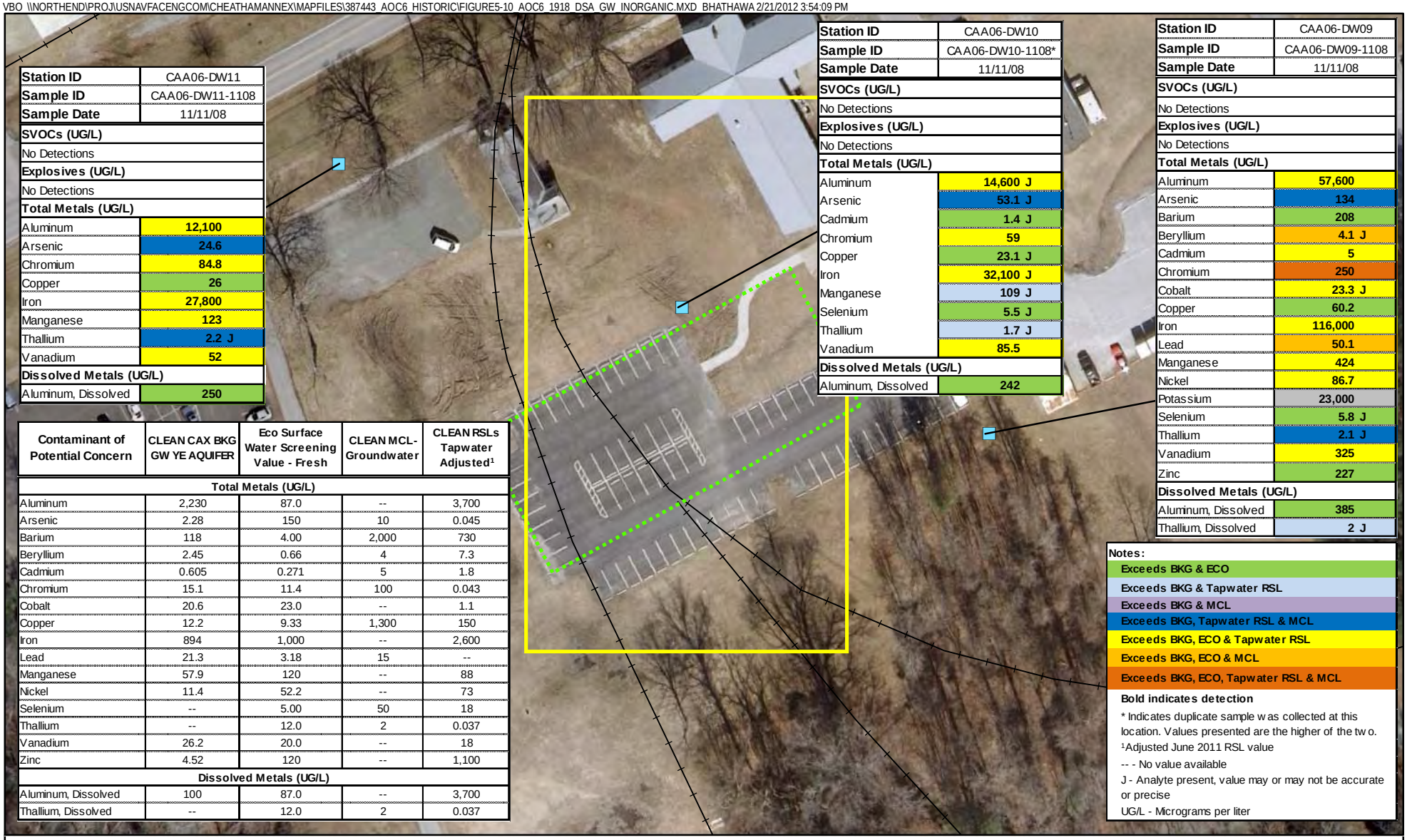
N W E S

0 40 80 Feet

Figure 5-9
AOC 6 Subsurface Soil Exceedance Results
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-10_AOC6_1918_DSA_GW_INORGANIC.MXD BHATHAWA 2/21/2012 3:54:09 PM



Station ID	CAA06-DW11
Sample ID	CAA06-DW11-1108
Sample Date	11/11/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	**12,100**
Arsenic	**24.6**
Chromium	**84.8**
Copper	**26**
Iron	**27,800**
Manganese	**123**
Thallium	**2.2 J**
Vanadium	**52**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**250**

Station ID	CAA06-DW10
Sample ID	CAA06-DW10-1108*
Sample Date	11/11/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	**14,600 J**
Arsenic	**53.1 J**
Cadmium	**1.4 J**
Chromium	**59**
Copper	**23.1 J**
Iron	**32,100 J**
Manganese	**109 J**
Selenium	**5.5 J**
Thallium	**1.7 J**
Vanadium	**85.5**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**242**

Station ID	CAA06-DW09
Sample ID	CAA06-DW09-1108
Sample Date	11/11/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	**57,600**
Arsenic	**134**
Barium	**208**
Beryllium	**4.1 J**
Cadmium	**5**
Chromium	**250**
Cobalt	**23.3 J**
Copper	**60.2**
Iron	**116,000**
Lead	**50.1**
Manganese	**424**
Nickel	**86.7**
Potassium	**23,000**
Selenium	**5.8 J**
Thallium	**2.1 J**
Vanadium	**325**
Zinc	**227**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**385**
Thallium, Dissolved	**2 J**

Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted[1]
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Barium	118	4.00	2,000	730
Beryllium	2.45	0.66	4	7.3
Cadmium	0.605	0.271	5	1.8
Chromium	15.1	11.4	100	0.043
Cobalt	20.6	23.0	--	1.1
Copper	12.2	9.33	1,300	150
Iron	894	1,000	--	2,600
Lead	21.3	3.18	15	--
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Selenium	--	5.00	50	18
Thallium	--	12.0	2	0.037
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Thallium, Dissolved	--	12.0	2	0.037

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Tapwater RSL
- Exceeds BKG & MCL
- Exceeds BKG, Tapwater RSL & MCL
- Exceeds BKG, ECO & Tapwater RSL
- Exceeds BKG, ECO & MCL
- Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

[1]Adjusted June 2011 RSL value

-- - No value available

J - Analyte present, value may or may not be accurate or precise

UG/L - Micrograms per liter

Legend

- Groundwater/Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs

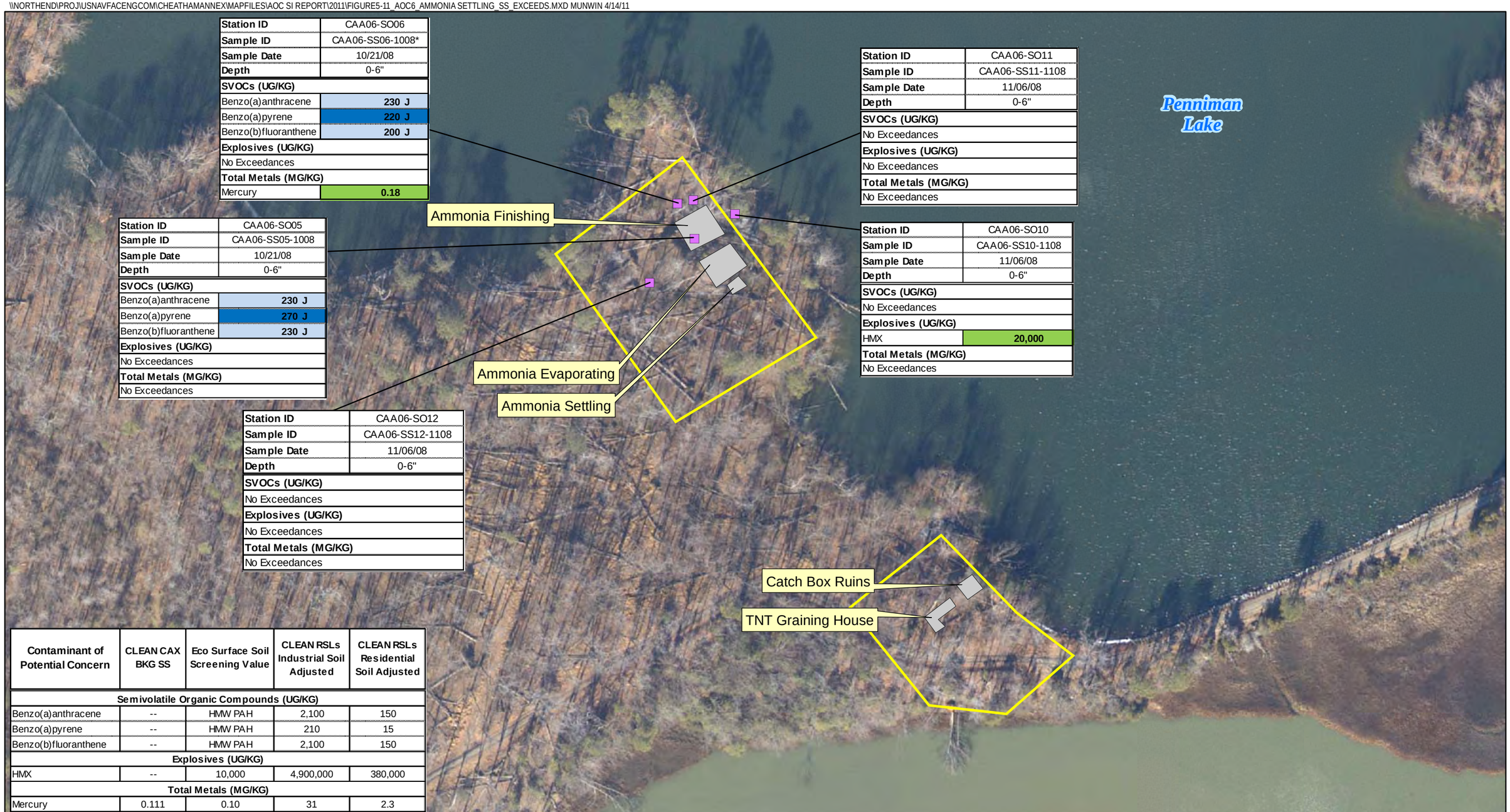
N W E S

0 40 80 Feet

Figure 5-10
AOC 6 Groundwater Exceedance Results
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-11_AOC6_AMMONIA SETTLING_SS_EXCEEDS.MXD MUNWIN 4/14/11



Station ID	CAA06-SO06
Sample ID	CAA06-SS06-1008*
Sample Date	10/21/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	230 J
Benzo(a)pyrene	220 J
Benzo(b)fluoranthene	200 J
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Mercury	0.18

Station ID	CAA06-SO11
Sample ID	CAA06-SS11-1108
Sample Date	11/06/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO05
Sample ID	CAA06-SS05-1008
Sample Date	10/21/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	230 J
Benzo(a)pyrene	270 J
Benzo(b)fluoranthene	230 J
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO10
Sample ID	CAA06-SS10-1108
Sample Date	11/06/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
HMX	20,000
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO12
Sample ID	CAA06-SS12-1108
Sample Date	11/06/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Semivolatile Organic Compounds (UG/KG)				
Benzo(a)anthracene	--	HMW PAH	2,100	150
Benzo(a)pyrene	--	HMW PAH	210	15
Benzo(b)fluoranthene	--	HMW PAH	2,100	150
Explosives (UG/KG)				
HMX	--	10,000	4,900,000	380,000
Total Metals (MG/KG)				
Mercury	0.111	0.10	31	2.3

Legend

- Soil Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, Res & Ind RSLs

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

[1]No value for the individual PAH was used; the constituent was evaluated as part of the total PAH (HMW) evaluation

-- - No value available

J - Analyte present, value may or may not be accurate or precise

UG/KG - Micrograms per kilogram

MG/KG - Milligrams per kilogram

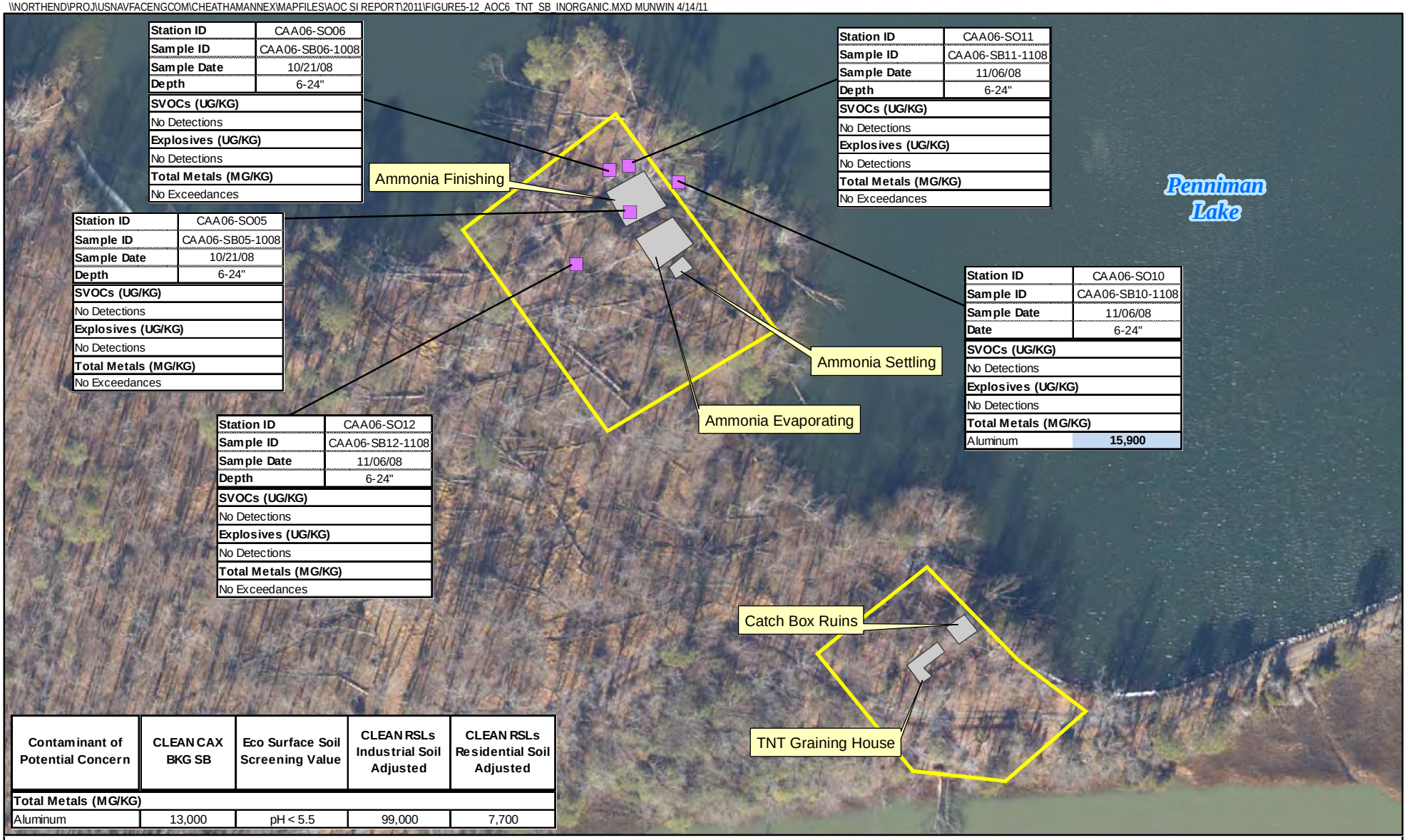
N W E S

0 100 200 Feet

Figure 5-11
AOC 6 Surface Soil Exceedance Results
Ammonia Settling Pit Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-12_AOC6_TNT_SB_INORGANIC.MXD MUNWIN 4/14/11



Station ID	CAA06-SO06
Sample ID	CAA06-SB06-1008
Sample Date	10/21/08
Depth	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO11
Sample ID	CAA06-SB11-1108
Sample Date	11/06/08
Depth	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO05
Sample ID	CAA06-SB05-1008
Sample Date	10/21/08
Depth	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO10
Sample ID	CAA06-SB10-1108
Sample Date	11/06/08
Date	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
Aluminum	**15,900**

Station ID	CAA06-SO12
Sample ID	CAA06-SB12-1108
Sample Date	11/06/08
Depth	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700

Legend

- Soil Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

Exceeds BKG & Res RSL

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

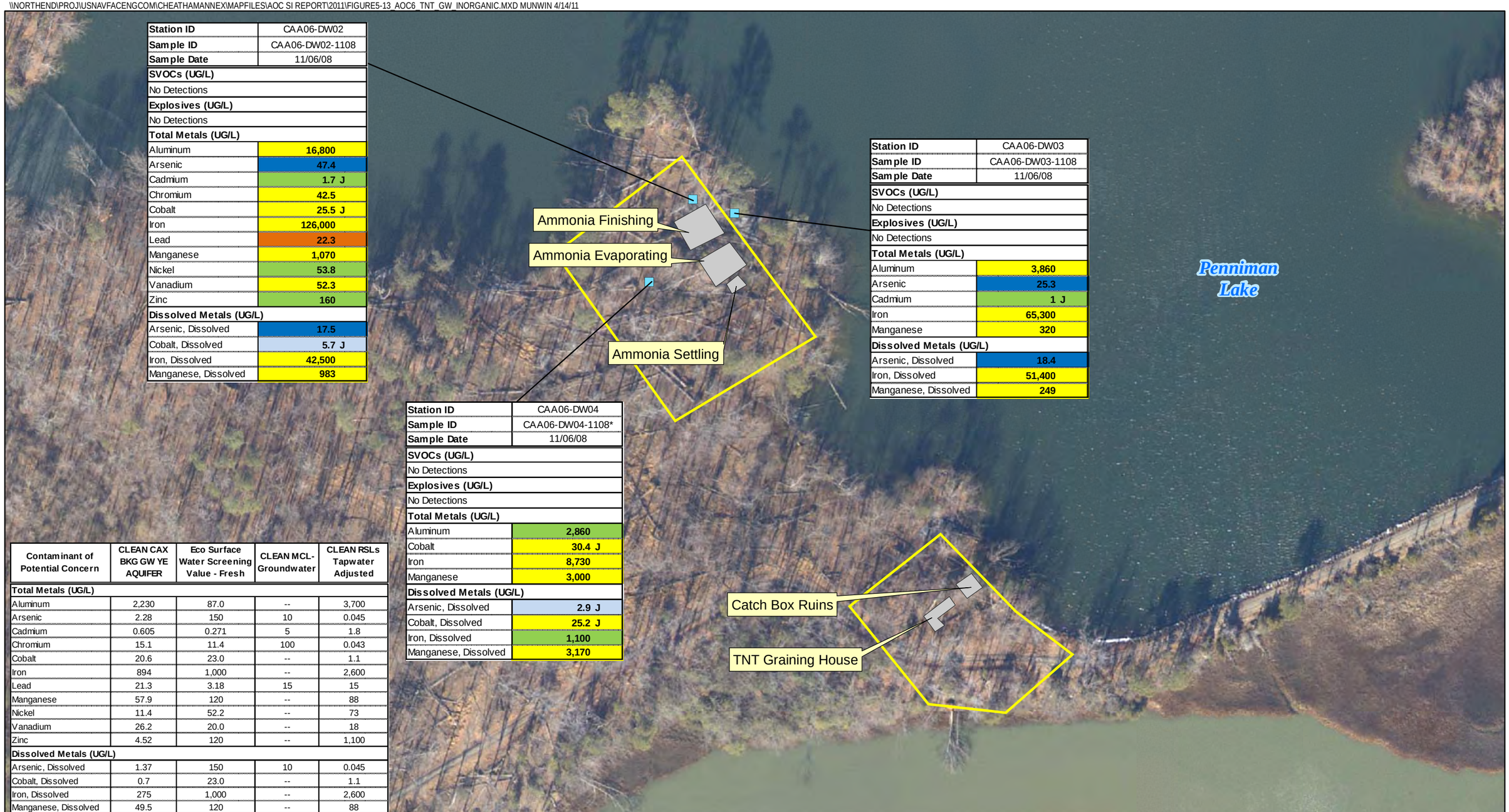
N W E S

0 60 120 Feet

Figure 5-12
AOC 6 Subsurface Soil Exceedance Results
Ammonia Settling Pit Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-13_AOC6_TNT_GW_INORGANIC.MXD MUNWIN 4/14/11



Station ID	CAA06-DW02
Sample ID	CAA06-DW02-1108
Sample Date	11/06/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	16,800
Arsenic	47.4
Cadmium	1.7 J
Chromium	42.5
Cobalt	25.5 J
Iron	126,000
Lead	22.3
Manganese	1,070
Nickel	53.8
Vanadium	52.3
Zinc	160
Dissolved Metals (UG/L)	
Arsenic, Dissolved	17.5
Cobalt, Dissolved	5.7 J
Iron, Dissolved	42,500
Manganese, Dissolved	983

Station ID	CAA06-DW03
Sample ID	CAA06-DW03-1108
Sample Date	11/06/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	3,860
Arsenic	25.3
Cadmium	1 J
Iron	65,300
Manganese	320
Dissolved Metals (UG/L)	
Arsenic, Dissolved	18.4
Iron, Dissolved	51,400
Manganese, Dissolved	249

Station ID	CAA06-DW04
Sample ID	CAA06-DW04-1108*
Sample Date	11/06/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	2,860
Cobalt	30.4 J
Iron	8,730
Manganese	3,000
Dissolved Metals (UG/L)	
Arsenic, Dissolved	2.9 J
Cobalt, Dissolved	25.2 J
Iron, Dissolved	1,100
Manganese, Dissolved	3,170

Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Cadmium	0.605	0.271	5	1.8
Chromium	15.1	11.4	100	0.043
Cobalt	20.6	23.0	--	1.1
Iron	894	1,000	--	2,600
Lead	21.3	3.18	15	15
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Arsenic, Dissolved	1.37	150	10	0.045
Cobalt, Dissolved	0.7	23.0	--	1.1
Iron, Dissolved	275	1,000	--	2,600
Manganese, Dissolved	49.5	120	--	88

Legend

- Groundwater/Soil Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Tapwater RSL
- Exceeds BKG, Tapwater RSL & MCL
- Exceeds BKG, ECO & Tapwater RSL
- Exceeds BKG, ECO, Tapwater RSL & MCL

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

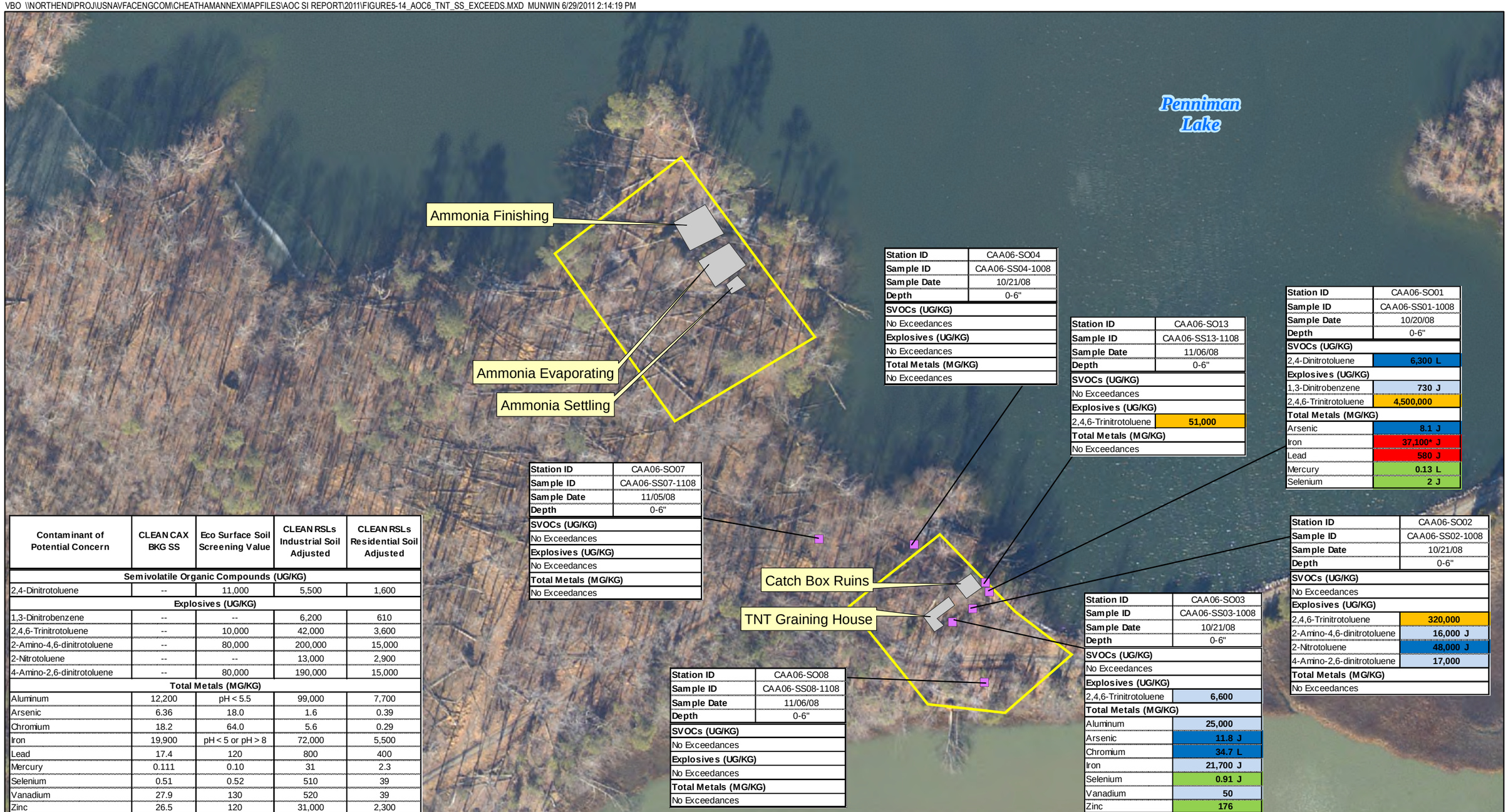
N
W E
S

0 100 200 Feet

Figure 5-13
AOC 6 Groundwater Exceedance Results
Ammonia Settling Pit Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-14_AOC6_TNT_SS_EXCEEDS.MXD MUNWIN 6/29/2011 2:14:19 PM



Station ID	CAA06-SO04
Sample ID	CAA06-SS04-1008
Sample Date	10/21/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO13
Sample ID	CAA06-SS13-1108
Sample Date	11/06/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
2,4,6-Trinitrotoluene	51,000
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO01
Sample ID	CAA06-SS01-1008
Sample Date	10/20/08
Depth	0-6"
SVOCs (UG/KG)	
2,4-Dinitrotoluene	6,300 L
Explosives (UG/KG)	
1,3-Dinitrobenzene	730 J
2,4,6-Trinitrotoluene	4,500,000
Total Metals (MG/KG)	
Arsenic	8.1 J
Iron	37,100* J
Lead	580 J
Mercury	0.13 L
Selenium	2 J

Station ID	CAA06-SO07
Sample ID	CAA06-SS07-1108
Sample Date	11/05/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO02
Sample ID	CAA06-SS02-1008
Sample Date	10/21/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
2,4,6-Trinitrotoluene	320,000
2-Amino-4,6-dinitrotoluene	16,000 J
2-Nitrotoluene	48,000 J
4-Amino-2,6-dinitrotoluene	17,000
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO03
Sample ID	CAA06-SS03-1008
Sample Date	10/21/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
2,4,6-Trinitrotoluene	6,600
Total Metals (MG/KG)	
Aluminum	25,000
Arsenic	11.8 J
Chromium	34.7 L
Iron	21,700 J
Selenium	0.91 J
Vanadium	50
Zinc	176

Station ID	CAA06-SO08
Sample ID	CAA06-SS08-1108
Sample Date	11/06/08
Depth	0-6"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Semivolatile Organic Compounds (UG/KG)				
2,4-Dinitrotoluene	--	11,000	5,500	1,600
Explosives (UG/KG)				
1,3-Dinitrobenzene	--	--	6,200	610
2,4,6-Trinitrotoluene	--	10,000	42,000	3,600
2-Amino-4,6-dinitrotoluene	--	80,000	200,000	15,000
2-Nitrotoluene	--	--	13,000	2,900
4-Amino-2,6-dinitrotoluene	--	80,000	190,000	15,000
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Iron	19,900	pH < 5 or pH > 8	72,000	5,500
Lead	17.4	120	800	400
Mercury	0.111	0.10	31	2.3
Selenium	0.51	0.52	510	39
Vanadium	27.9	130	520	39
Zinc	26.5	120	31,000	2,300

Legend

- Soil Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO & Res RSL
- Exceeds BKG, Res & Ind RSLs
- Exceeds BKG, ECO, Res & Ind RSLs

*Eco exceedance due to pH value
-- - No value available
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

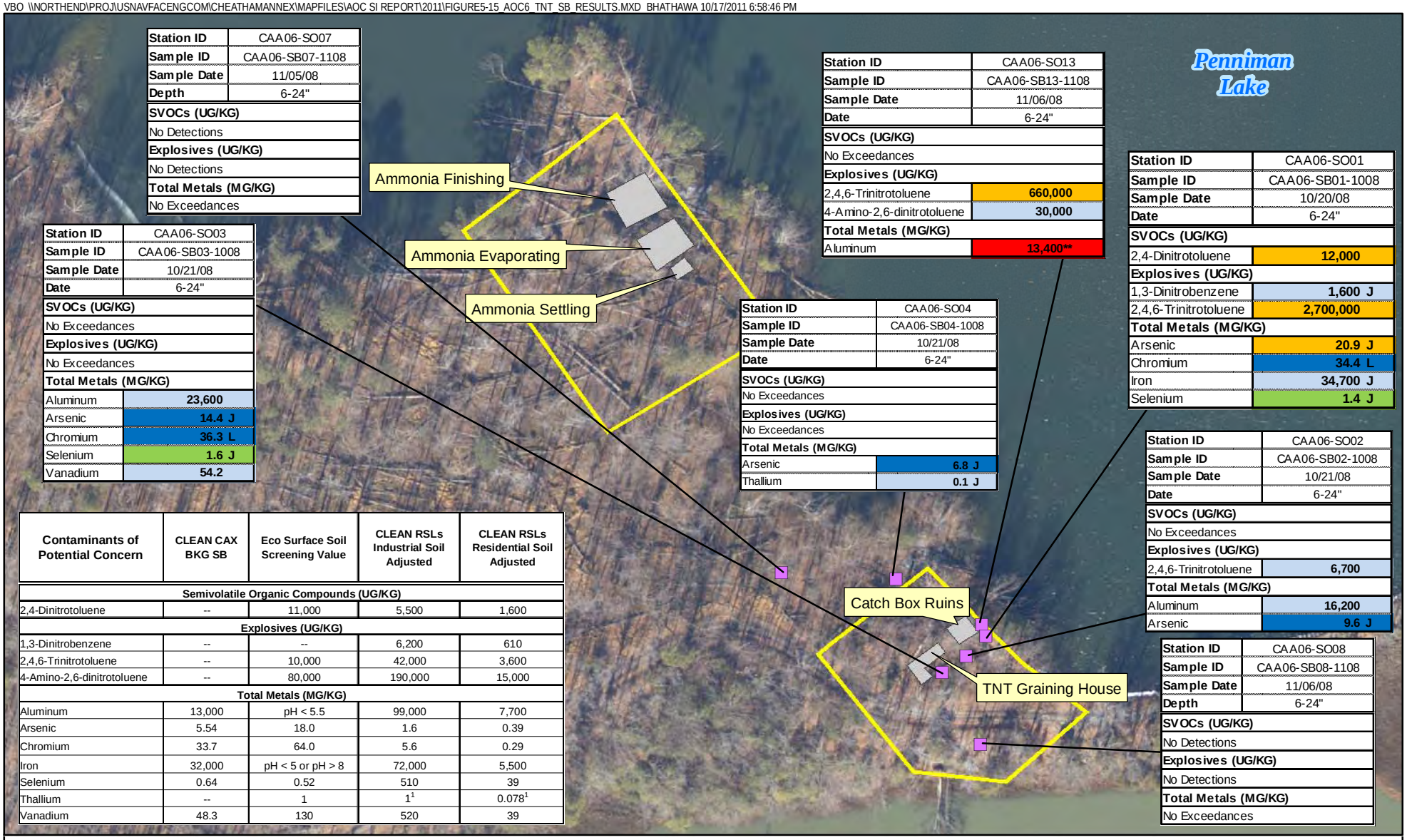
N W E S

0 100 200 Feet

Figure 5-14
AOC 6 Surface Soil Exceedance Results
TNT Graining House and Catch Box Ruins Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-15_AOC6_TNT_SB_RESULTS.MXD BHATHAWA 10/17/2011 6:58:46 PM



Station ID	CAA06-SO07
Sample ID	CAA06-SB07-1108
Sample Date	11/05/08
Depth	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO03
Sample ID	CAA06-SB03-1008
Sample Date	10/21/08
Date	6-24"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	23,600
Arsenic	14.4 J
Chromium	36.3 L
Selenium	1.6 J
Vanadium	54.2

Station ID	CAA06-SO13
Sample ID	CAA06-SB13-1108
Sample Date	11/06/08
Date	6-24"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
2,4,6-Trinitrotoluene	660,000
4-Amino-2,6-dinitrotoluene	30,000
Total Metals (MG/KG)	
Aluminum	13,400**

Station ID	CAA06-SO04
Sample ID	CAA06-SB04-1008
Sample Date	10/21/08
Date	6-24"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	6.8 J
Thallium	0.1 J

Station ID	CAA06-SO01
Sample ID	CAA06-SB01-1008
Sample Date	10/20/08
Date	6-24"
SVOCs (UG/KG)	
2,4-Dinitrotoluene	12,000
Explosives (UG/KG)	
1,3-Dinitrobenzene	1,600 J
2,4,6-Trinitrotoluene	2,700,000
Total Metals (MG/KG)	
Arsenic	20.9 J
Chromium	34.4 L
Iron	34,700 J
Selenium	1.4 J

Station ID	CAA06-SO02
Sample ID	CAA06-SB02-1008
Sample Date	10/21/08
Date	6-24"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
2,4,6-Trinitrotoluene	6,700
Total Metals (MG/KG)	
Aluminum	16,200
Arsenic	9.6 J

Station ID	CAA06-SO08
Sample ID	CAA06-SB08-1108
Sample Date	11/06/08
Depth	6-24"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Contaminants of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Semivolatile Organic Compounds (UG/KG)				
2,4-Dinitrotoluene	--	11,000	5,500	1,600
Explosives (UG/KG)				
1,3-Dinitrobenzene	--	--	6,200	610
2,4,6-Trinitrotoluene	--	10,000	42,000	3,600
4-Amino-2,6-dinitrotoluene	--	80,000	190,000	15,000
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Arsenic	5.54	18.0	1.6	0.39
Chromium	33.7	64.0	5.6	0.29
Iron	32,000	pH < 5 or pH > 8	72,000	5,500
Selenium	0.64	0.52	510	39
Thallium	--	1	1[1]	0.078[1]
Vanadium	48.3	130	520	39

Legend

- Soil Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

[1]Adjusted June 2011 RSL value
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
**Eco exceedance due to pH value
-- - No value available
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher

UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO & Res RSL
- Exceeds BKG, Res & Ind RSLs
- Exceeds BKG, ECO, Res & Ind RSLs

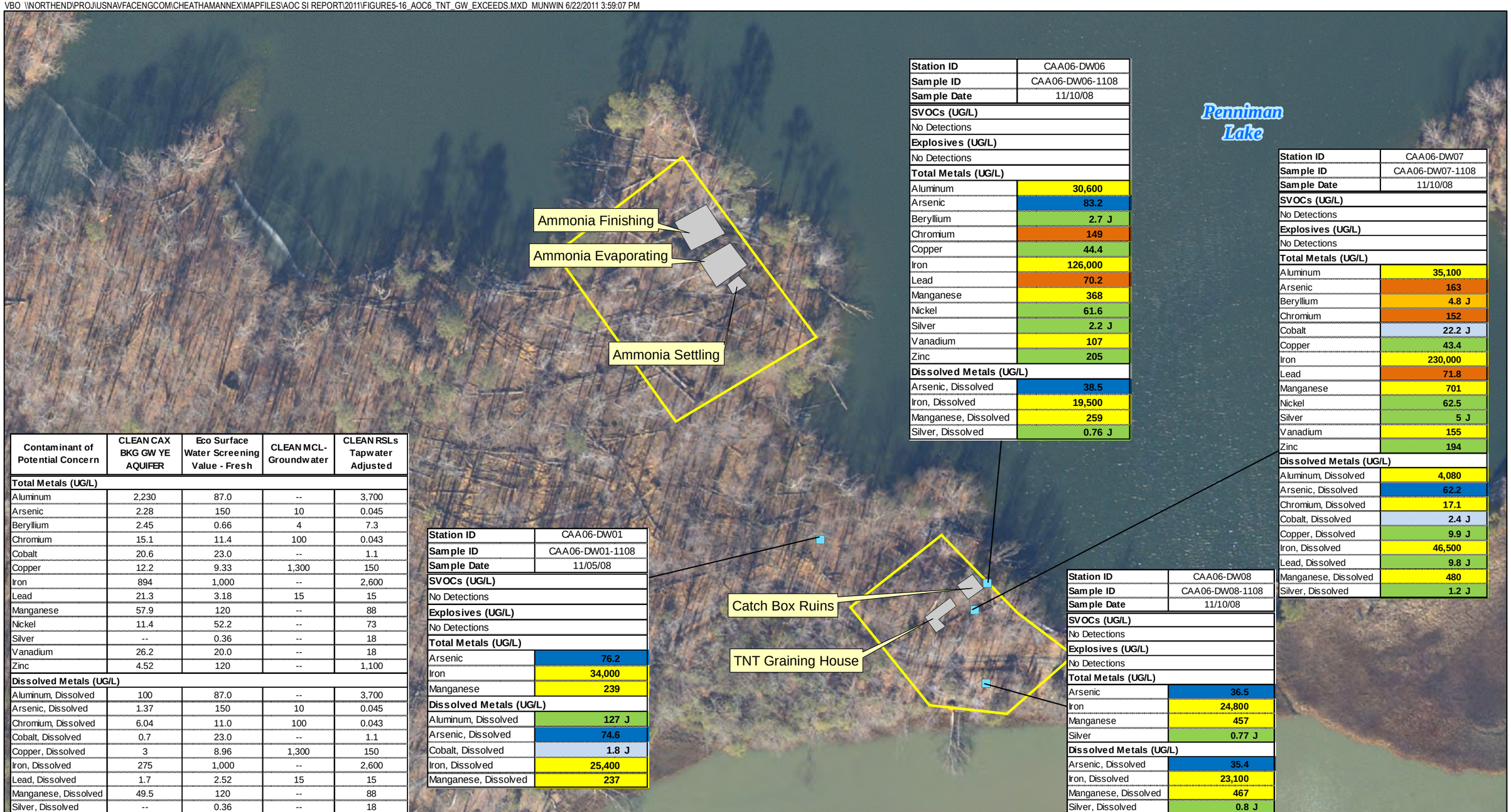
N W E S

0 60 120 Feet

Figure 5-15
AOC 6 Subsurface Soil Exceedance Results
TNT Graining House and Catch Box Ruins Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-16_AOC6_TNT_GW_EXCEEDS.MXD MUNWIN 6/22/2011 3:59:07 PM



Station ID	CAA06-DW06
Sample ID	CAA06-DW06-1108
Sample Date	11/10/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	30,600
Arsenic	83.2
Beryllium	2.7 J
Chromium	149
Copper	44.4
Iron	126,000
Lead	70.2
Manganese	368
Nickel	61.6
Silver	2.2 J
Vanadium	107
Zinc	205
Dissolved Metals (UG/L)	
Arsenic, Dissolved	38.5
Iron, Dissolved	19,500
Manganese, Dissolved	259
Silver, Dissolved	0.76 J

Station ID	CAA06-DW07
Sample ID	CAA06-DW07-1108
Sample Date	11/10/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	35,100
Arsenic	163
Beryllium	4.8 J
Chromium	152
Cobalt	22.2 J
Copper	43.4
Iron	230,000
Lead	71.8
Manganese	701
Nickel	62.5
Silver	5 J
Vanadium	155
Zinc	194
Dissolved Metals (UG/L)	
Aluminum, Dissolved	4,080
Arsenic, Dissolved	62.2
Chromium, Dissolved	17.1
Cobalt, Dissolved	2.4 J
Copper, Dissolved	9.9 J
Iron, Dissolved	46,500
Lead, Dissolved	9.8 J
Manganese, Dissolved	480
Silver, Dissolved	1.2 J

Station ID	CAA06-DW01
Sample ID	CAA06-DW01-1108
Sample Date	11/05/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Arsenic	76.2
Iron	34,000
Manganese	239
Dissolved Metals (UG/L)	
Aluminum, Dissolved	127 J
Arsenic, Dissolved	74.6
Cobalt, Dissolved	1.8 J
Iron, Dissolved	25,400
Manganese, Dissolved	237

Station ID	CAA06-DW08
Sample ID	CAA06-DW08-1108
Sample Date	11/10/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Arsenic	36.5
Iron	24,800
Manganese	457
Silver	0.77 J
Dissolved Metals (UG/L)	
Arsenic, Dissolved	35.4
Iron, Dissolved	23,100
Manganese, Dissolved	467
Silver, Dissolved	0.8 J

Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Beryllium	2.45	0.66	4	7.3
Chromium	15.1	11.4	100	0.043
Cobalt	20.6	23.0	--	1.1
Copper	12.2	9.33	1,300	150
Iron	894	1,000	--	2,600
Lead	21.3	3.18	15	15
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Silver	--	0.36	--	18
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Arsenic, Dissolved	1.37	150	10	0.045
Chromium, Dissolved	6.04	11.0	100	0.043
Cobalt, Dissolved	0.7	23.0	--	1.1
Copper, Dissolved	3	8.96	1,300	150
Iron, Dissolved	275	1,000	--	2,600
Lead, Dissolved	1.7	2.52	15	15
Manganese, Dissolved	49.5	120	--	88
Silver, Dissolved	--	0.36	--	18

Legend

- Groundwater/Soil Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Tapwater RSL
- Exceeds BKG, Tapwater RSL & MCL
- Exceeds BKG, ECO & Tapwater RSL
- Exceeds BKG, ECO & MCL
- Exceeds BKG, ECO, Tapwater RSL & MCL

-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

N W E S

0 100 200 Feet

Figure 5-16
AOC 6 Groundwater Exceedance Results
TNT Graining House and Catch Box Ruins Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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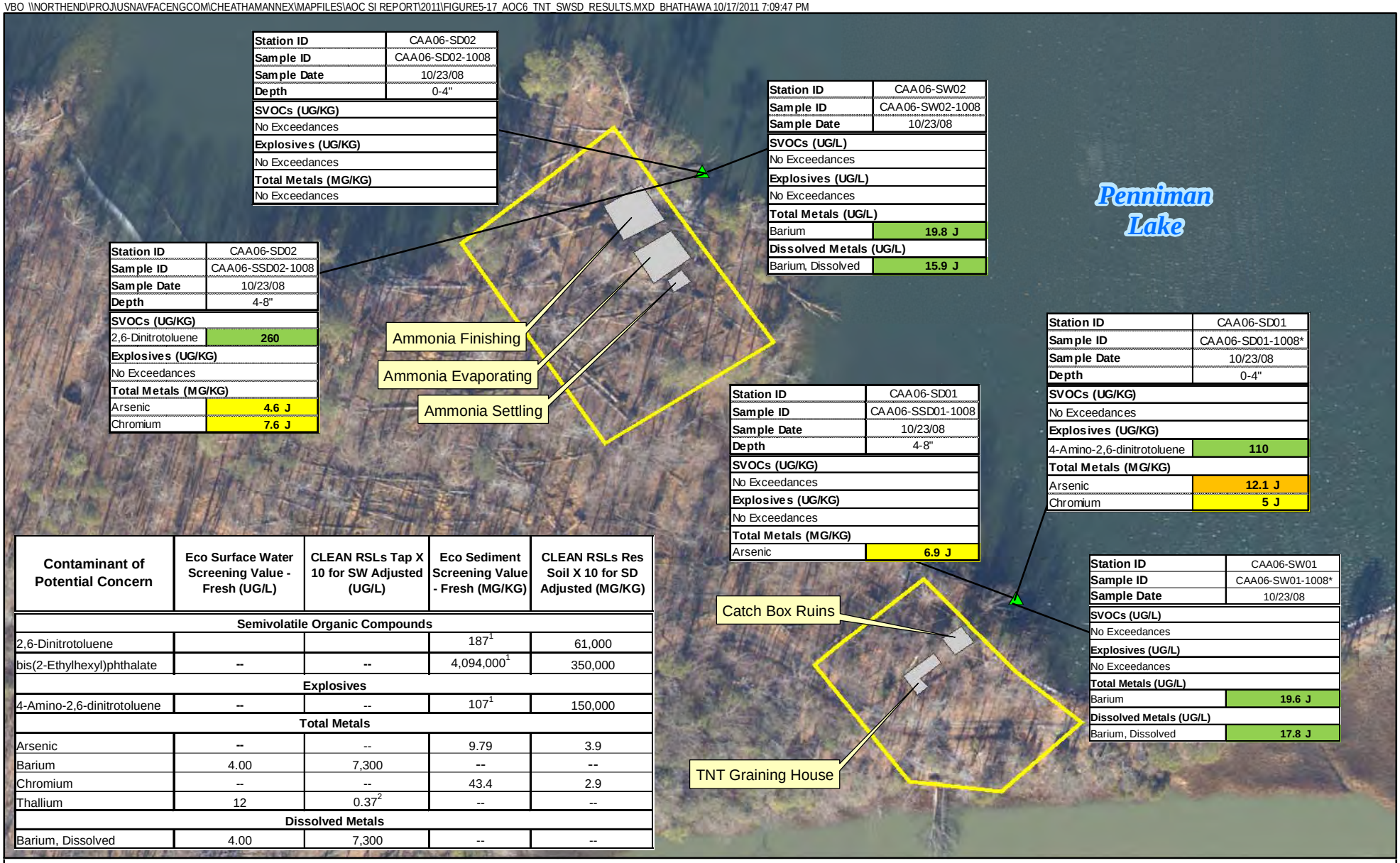
VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE5-17_AOC6_TNT_SWSD_RESULTS.MXD BHATHAWA 10/17/2011 7:09:47 PM



Station ID	CAA06-SD02
Sample ID	CAA06-SD02-1008
Sample Date	10/23/08
Depth	0-4"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SW02
Sample ID	CAA06-SW02-1008
Sample Date	10/23/08
SVOCs (UG/L)	
No Exceedances	
Explosives (UG/L)	
No Exceedances	
Total Metals (UG/L)	
Barium	19.8 J
Dissolved Metals (UG/L)	
Barium, Dissolved	15.9 J

Station ID	CAA06-SD02
Sample ID	CAA06-SSD02-1008
Sample Date	10/23/08
Depth	4-8"
SVOCs (UG/KG)	
2,6-Dinitrotoluene	260
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	4.6 J
Chromium	7.6 J

Station ID	CAA06-SD01
Sample ID	CAA06-SD01-1008*
Sample Date	10/23/08
Depth	0-4"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
4-Amino-2,6-dinitrotoluene	110
Total Metals (MG/KG)	
Arsenic	12.1 J
Chromium	5 J

Station ID	CAA06-SD01
Sample ID	CAA06-SSD01-1008
Sample Date	10/23/08
Depth	4-8"
SVOCs (UG/KG)	
No Exceedances	
Explosives (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	6.9 J

Station ID	CAA06-SW01
Sample ID	CAA06-SW01-1008*
Sample Date	10/23/08
SVOCs (UG/L)	
No Exceedances	
Explosives (UG/L)	
No Exceedances	
Total Metals (UG/L)	
Barium	19.6 J
Dissolved Metals (UG/L)	
Barium, Dissolved	17.8 J

Contaminant of Potential Concern	Eco Surface Water Screening Value - Fresh (UG/L)	CLEAN RSLs Tap X 10 for SW Adjusted (UG/L)	Eco Sediment Screening Value - Fresh (MG/KG)	CLEAN RSLs Res Soil X 10 for SD Adjusted (MG/KG)
Semivolatile Organic Compounds				
2,6-Dinitrotoluene			187[1]	61,000
bis(2-Ethylhexyl)phthalate	--	--	4,094,000[1]	350,000
Explosives				
4-Amino-2,6-dinitrotoluene	--	--	107[1]	150,000
Total Metals				
Arsenic	--	--	9.79	3.9
Barium	4.00	7,300	--	--
Chromium	--	--	43.4	2.9
Thallium	12	0.37[2]	--	--
Dissolved Metals				
Barium, Dissolved	4.00	7,300	--	--

Legend

- Sediment/Surface Water Sample Location
- Approximate AOC 6 Study Area
- Buildings

Notes:

- Exceeds ECO
- Exceeds Res RSL
- Exceeds Eco & Res RSL

[1]Equilibrium Partitioning Value used as eco screening value. See Tables B-41 and B-43 in Appendix B.
[2]Adjusted June 2011 Tapwater RSL
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
MG/KG - Milligrams per kilogram
UG/L - Micrograms per liter

N W E S

0 60 120 Feet

Figure 5-17
AOC 6 Surface Water and Sediment Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

SECTION 6

AOC 7—Drum Disposal and Can Pit Area

This section presents an evaluation of the results from the SI performed at AOC 7. The section includes a summary of the investigations conducted at the site, the conceptual site model, and the release assessment decision analysis.

6.1 History of Investigation

There has been no sampling associated with AOC 7 prior to the 2008 SI field activities. However, a housekeeping effort was conducted by Shaw Environmental in March and April 2006 to remove all visible surface debris (Shaw, 2006).

6.2 Conceptual Site Model

The CSM for AOC 7 is based on the data collected as part of the SI. The CSM interprets the physical characteristics, the distribution of contamination and potential contaminant source, potential migration pathways, and the potential exposure and receptor pathways. The CSM for AOC 7 is shown in **Figure 6-1**.

6.2.1 Site History and Potential Sources of Release

AOC 7 is approximately 1.5 acres in size and consists of several small surface debris disposal areas containing 55-gallon drums (the former Drum Disposal Area) and numerous cans (the Can Pit) (**Figure 6-2**).

Housekeeping Efforts

In April 2004, the Navy identified an area of potential concern north of CAD Building 14 and Environmental Restoration Site 8, and named it AOC 7. This area consisted of several historical, small surface debris disposal areas containing 55-gallon drums (the former Drum Disposal Area) and numerous cans (the Can Pit). The Can Pit, an area that was measured to be approximately 30-by-20- feet and 4- feet deep, contained approximately 40, 10-gallon rusted cans with labeling containing the word “tetrachloroethane.”

In March 2006, 1.4 tons of surface debris was removed by Shaw Environmental from the Can Pit and the immediate surrounding area (**Figure 6-2**). In April 2006, approximately 20 rusty pails and two empty 55-gallon drums were removed from the former Drum Disposal Area (**Figure 6-2**). Following removal activities, all surface debris from AOC 7 were transported to Bethal Landfill for proper disposal (Shaw, 2006).

2008 Site Inspection Activities

AOC 7 investigation activities included pre-excavation DPT surface soil, subsurface soil, and groundwater sampling from within the former Drum Disposal Area and Can Pit, and pre-excavation surface and subsurface soil sampling within the immediate vicinity.

Following pre-excavation sampling, test pitting activities were conducted to delineate the horizontal and vertical extent of buried debris. Deep subsurface soil samples from within the test pits were collected to determine the vertical extent of contamination and potential subsurface migration, if applicable. DPT surface soil, subsurface soil and groundwater samples were collected from the assumed upgradient and downgradient directions to evaluate potential migration pathways. An explanation for each activity and methods of sample collection are documented in Section 2.

6.2.2 Physical Setting

Topography and Surface Water

AOC 7 is located immediately south of one of the southern fingers of Cheatham Pond. Although the topography of AOC 7 is relatively flat, the topography generally slopes northeast, towards Cheatham Pond (**Figure 6-2**). With the exception of the trail created to conduct the housekeeping effort (currently used as a hiking trail), this area is heavily vegetated with shrubs and trees.

There are no wetlands or surface water bodies located within AOC 7. Surface runoff as a result of heavy rain events is expected to flow toward the northeast to Cheatham Pond. The presumed direction of surface water flow is illustrated on the CSM (**Figure 6-1**).

Hydrogeology

In general, the uppermost soil within the vicinity of AOC 7 is predominantly olive and brown silt with varying degrees of sand and clay. A thin layer of organic material (0.5-feet thick) was observed between 7 and 10 feet bgs. Below this layer, olive yellow and yellowish brown sands were observed. Soil boring logs from the SI field activities present descriptions of the soil and general subsurface geology and are included as **Appendix C**.

The first encountered groundwater underlying AOC 7 is the Yorktown-Eastover Aquifer at depths ranging from approximately 9 to 20 feet bgs. Groundwater is expected to flow northwest (from the former Drum Disposal Area) and northeast (from the Can Pit) toward Cheatham Pond.

Current and Future Land Use

AOC 7 is within the confines of CAX and access is restricted to the general public. Navy and DoD personnel have access to AOC 7 as it is a wooded area located along a popular hiking trail. Future land use at AOC 7 is not expected to change and will likely continue as a wooded recreational area in the foreseeable future.

6.2.3 Distribution of Contamination

Data collected during the 2008 SI field activities were evaluated as part of this SI report (**Figure 6-3**). **Tables 6-1** through **Table 6-3** summarize all constituents detected in AOC 7 soil and groundwater. No sediment or surface water is associated with AOC 7. All analytical data for the SI samples are provided in **Appendix H**.

Buried Debris

Test pitting activities were conducted on October 30 and 31, 2008 to determine the horizontal and vertical extent of debris within the Can Pit and the former Drum Disposal Area at AOC 7 (**Figure 6-3**). In total, five test pits were excavated to delineate the extent of buried debris within the Can Pit (SO02 and TP01 through TP04) and five test pits were excavated to delineate the extent of buried debris within the former Drum Disposal Area (TP05 through TP09).

One test pit (SO02) was excavated to approximately 16 feet bgs in the middle of the Can Pit. Since buried debris was encountered within the Can Pit, additional test pits (TP01 through TP04) were advanced to 10 feet bgs directly to the north, east, south, and west to determine the horizontal and vertical extent. No buried debris was encountered within these four test pits. Buried debris within the Can Pit included rusted, flakey, metal shards (located at the bottom of the Can Pit) followed by amber glass Clorox bottles, and 4-inch tall clear bottles (located between 1 and 10 feet below the surface of the Can Pit [or 5 and 14 feet bgs]).

One test pit (TP09) was excavated to 10 feet bgs in the middle of the former Drum Disposal Area. Even though buried debris was not encountered within test pit TP09, four additional 10 foot deep test pits were excavated directly north, east, south, and west of test pit TP09 to confirm the absence of buried debris. No buried debris was encountered within these four test pits and the 2006 housekeeping effort successfully removed all debris from the former Drum Disposal Area.

A detailed summary of the AOC 7 test pitting activities is included in **Appendix J**. The estimated extent of buried debris within the Can Pit is depicted on **Figure 6-4**.

Soil

Five pre-excavation surface (0-6 inches) and shallow subsurface (6-24 inches) soil samples were collected from the center of and within the immediate vicinity of the former Drum Disposal Area and the Can Pit, and three deep subsurface soil samples (10 feet bgs) were collected at the bottom of three test pits, as part of the 2008 SI field activities. In addition, two surface and shallow subsurface soil samples were collected off-site, from the assumed upgradient (in an area assumed to be unaffected by site conditions) and downgradient directions (**Table 2-1**). Sample locations were positioned to determine if a release occurred from the debris and to characterize potential migration pathways.

All soil samples were analyzed for VOCs, SVOCs, inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine), TOC, and pH. The soil analytical results are listed in **Tables 6-1 and 6-2**, and the exceedances are shown on **Figures 6-5 and 6-6**.

VOCs, SVOCs, Pesticides, PCBs and Explosives

No VOCs, SVOCs, pesticides, PCBs, or explosives were detected at concentrations above their respective screening criterion in surface or subsurface soil samples (**Tables 6-1** and **6-2**).

Inorganic Constituents

Nine inorganics (aluminum, arsenic, chromium, cobalt, copper, iron, lead, manganese, and zinc) exceeded at least one screening criterion in pre-excavation surface soil samples (**Figure 6-5**).

- Aluminum exceeded the residential RSL (7,700 mg/kg) in one surface soil sample (SS05) at a concentration of 13,000 mg/kg, located immediately outside the Can Pit. However, aluminum was only slightly above its base background UTL (12,200 mg/kg) and is likely attributable to background.
- Arsenic, chromium, cobalt, copper, iron, lead, and manganese only exceeded background concentrations and a screening criterion within the surface soil sample (SS02) collected at the Can Pit. Arsenic, chromium, copper, iron, and lead are likely attributable to the debris. Cobalt and manganese concentrations (10.3J and 921L mg/kg, respectively) slightly exceeded their respective background UTLs (9.9 and 324 mg/kg) and are likely attributable to natural background conditions.
- Arsenic, chromium, iron, lead, manganese, and zinc only exceeded background concentrations and a screening criterion within the surface soil sample (SS03) collected within the former Drum Disposal Area. Chromium, iron, lead, and zinc are likely attributable to the former debris. Arsenic and manganese slightly exceeded their respective background UTLs (6.4 and 324 mg/kg) with concentrations of 7.9L and 436L mg/kg, respectively. Arsenic and manganese are commonly associated with chemical weathering of volcanic rocks and are likely attributable to natural background conditions.

Six inorganics (aluminum, arsenic, cobalt, lead, manganese, and zinc) exceeded at least one screening criterion in pre-excavation shallow subsurface soil (**Figure 6-6**). No inorganics exceeded their respective screening criterion in deep subsurface soil (**Figure 6-6**).

- Aluminum, arsenic, and cobalt exceeded a screening criterion within shallow subsurface soil within the Can Pit with maximum concentrations of 22,900, 8.1 L, and 5.2J mg/kg, respectively. However, each concentration slightly exceeded background concentrations and are likely attributable to natural background conditions.
- Manganese, lead, and zinc exceeded a screening criterion within shallow subsurface soil in the area of the former Drum Disposal Area with maximum concentrations of 270 L, 175 J, and 282 mg/kg, respectively. Lead and zinc exceeded a screening criterion only at one sample within the middle of the disposal area and are likely associated with the former debris. Manganese slightly exceeded the background concentration and is likely attributable to natural background conditions.

Groundwater

Groundwater samples were collected from four DPT locations (DW01 through DW04) during the 2008 SI field activities (**Table 2-1**). Two of these locations (DW02 and DW03) were positioned to determine if a release occurred to groundwater in the areas with the highest potential for contamination. DW01 and DW04 were positioned upgradient and downgradient, respectively, from the site.

All groundwater samples were submitted for analysis of VOCs, SVOCs, pesticides and PCBs, inorganics (total and dissolved), cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine). The groundwater analytical results are listed in **Table 6-3** and the exceedances are shown on **Figure 6-7**.

VOCs, SVOCs, Pesticides, PCBs and Explosives

- Only one VOC (ethylbenzene) was detected above a screening criterion (Tap Water RSL of 1.5 µg/L) with a concentration of 2J µg/L, at one sample located upgradient of the site (**Table 6-3** and **Figure 6-7**). No SVOCs, pesticides, PCBs, or explosives were detected above screening criteria.

Inorganic Constituents

Thirteen total inorganics (aluminum, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) and five dissolved inorganics (aluminum, arsenic, chromium, cobalt, and iron) exceeded at least one screening criterion and background concentrations in groundwater (**Figure 6-7**).

Dissolved inorganics data are likely more representative of inorganic concentrations migrating in groundwater, since the DPT method generally results in higher total inorganic concentrations due to the higher turbidity of the sampling technique.

- The upgradient groundwater sample (DW01) had the most frequently detected inorganic constituents. However, only aluminum and arsenic were detected in the dissolved fraction at this location, and are likely a result of the higher sample turbidity. Dissolved aluminum and arsenic concentrations (172J µg/L and 2.2J µg/L) were only slightly above their respective background UTLs of 100 µg/L and 1.4 µg/L and are likely attributable to natural background conditions.
- Dissolved aluminum, chromium, cobalt, and iron were detected above background and a screening criterion in one sample adjacent to the Can Pit. Chromium and cobalt slightly exceeded background concentrations and are likely attributable to natural background conditions.

6.2.4 Potential Exposure and Receptor Pathways

Potential receptors at AOC 7 include current recreational users/visitors, trespassers, maintenance workers, industrial workers, future adult/child residents, and construction workers, and lower trophic level terrestrial receptors (plants and soil invertebrates).

Human Health Risk Evaluation

The HHRS evaluation for AOC 7 is presented in **Appendix A**. The supporting tables for the evaluation are presented in **Appendix A**, **Attachment A.4**. An overview of the various potential receptors and exposure pathways at the site is presented in **Figure A-1** of **Appendix A**. The results of the evaluation for AOC 7 are summarized as follows.

Surface Soil

The risk-based screening for surface soil at AOC 7 is provided in **Appendix A**, **Attachment A.4**, **Tables 2.1** through **2.1b**.

- In Step 1, seven constituents were detected in surface soil samples at concentrations above background (for inorganics) and the human health screening levels, and were selected as COPCs – aluminum, arsenic, chromium, cobalt, iron, lead, and manganese. The average lead concentration in surface soil is 186 mg/kg, which is less than the lead screening level for residential soil (400 mg/kg). Therefore, lead is not considered to be present at a concentration of potential concern, and lead was eliminated as a COPC.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 5×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.2 to 4; two of four HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were identified as COPCs and include aluminum, arsenic, chromium, iron, and manganese.
- In Step 3, based on the use of the 95 percent UCL for the EPCs, a cumulative cancer risk of 4×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs

ranged from 0.1 to 3; one of three HI values was greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or the cumulative target organ HI greater than 0.5 were selected as COPCs, which include arsenic, chromium, and iron.

Exposure to surface soil at AOC 7 may result in unacceptable human health risks associated with arsenic, chromium, and iron. The potential unacceptable carcinogenic risk is primarily associated with chromium, the only COPC that alone contributes a risk above the screening benchmark level. It was assumed that all of the chromium detected in the soil is in the hexavalent form, which is highly unlikely. Therefore, it is likely there would be no unacceptable carcinogenic risk associated with exposure to the surface soil. The potential unacceptable noncarcinogenic hazard is primarily associated with iron, which is a required human nutrient. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA07-SS02-1008. Ingestion of soil at the maximum detected concentration of iron [213,000 mg/kg, which would result in ingestion of 21.3 mg/day iron for an adult (213,000 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 42.6 mg/day iron (213,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is slightly above the UL of 40 mg/day for children. However, it is unlikely there would be any adverse effects associated with exposure to iron in the surface soil at the site.

Subsurface Soil

- The risk-based screening for subsurface soil at AOC 7 is provided in **Appendix A**, **Attachment A.4**, **Tables 2.2** through **2.3**. In Step 1, three constituents were detected in subsurface soil samples at concentrations above background (for metals) and the human health screening levels, and were identified as COPCs—aluminum, arsenic, and manganese.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-5} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs of 0.3 and 0.4 were calculated for the COPCs; these HI values were less than the cumulative target organ HI risk-ratio screening benchmark of 0.5.

The one subsurface soil collected from the subsurface soil beneath the Can Pit was evaluated separately from the rest of the subsurface soil samples (Table 2.3, Attachment A.4), as this sample was collected from a depth considered deeper than typical human exposure (about 14-16 feet below ground surface) and this sample represents anything that could have leached from the Can Pit to soil beneath the Can Pit.

- In Step 1, for the one subsurface soil sample collected from beneath the Can Pit, there were no constituents detected at concentrations above background (for metals) and the human health screening levels; therefore, no constituents were identified as COPCs.

Exposure to subsurface soil at AOC 7 would not be expected to result in any unacceptable human health risks.

Groundwater

The risk-based screening for groundwater at AOC 7 is provided in **Appendix A**, **Attachment A.4, Tables 2.4** and **2.4a**.

- In Step 1, ten constituents were detected in groundwater samples at concentrations above background (for VOCs and inorganics) and the human health screening levels, and were identified as COPCs—ethylbenzene, aluminum, arsenic, chromium, iron, lead, manganese, nickel, selenium, and vanadium. The maximum lead concentration in AOC 7 groundwater was 30.7 µg/L, which is greater than the lead screening level (15 µg/L); however, the average concentration was 10 µg/L, which is below the screening level. Therefore, lead is not considered to be present at a concentration of potential concern. Also, lead was not detected in the dissolved phase.

- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 6×10^{-3} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs ranged from 0.1 to 5; four of the six HI values were greater than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk or a cumulative target organ HI greater than 0.5 were identified as COPCs and include ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium.
- Step 3 was not performed because less than five samples were available for groundwater.

Exposure to groundwater at AOC 7 may result in unacceptable human health risks. The risk is associated with ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium detected in the groundwater.

Ecological Risk Evaluation

The results of the risk evaluation for AOC 7 are presented in **Appendix B, Tables B-44** through **B-49**.

Surface Soil

Six inorganics (arsenic, chromium, copper, lead, manganese, and zinc) exceeded screening values based on maximum detected concentrations and also exceeded background values, where available (**Tables B-44** and **B-45**). Thus, these six constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for arsenic, chromium, and copper were less than 1.0. Thus, these three constituents were not identified as refined COPCs.
- The mean HQs exceeded 1.0 for lead (1.55), manganese (1.49), and zinc (1.19); these three constituents were identified as refined COPCs.

Subsurface Soil

Five inorganics (aluminum, lead, manganese, selenium, and zinc) exceeded screening values based on either maximum detected concentrations or pH and also exceeded background values, where available (**Appendix B, Tables B-46** and **B-47**). Screening values were not available for nitroguanidine. Thus, these six constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Nitroguanidine, which did not have a screening value, was detected at a maximum concentration of 63.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg. The maximum site concentration of nitroguanidine was less than the soil screening values for these other explosives. Thus, this constituent was not identified as a refined COPC.
- The mean HQs for aluminum, lead, manganese, and zinc were less than 1.0. Thus, these four constituents were not identified as refined COPCs.
- Selenium exceeded screening values in 1 of 6 samples at a maximum HQ of 1.23. The background value was equaled, but not exceeded, in this one sample. Thus, selenium is considered to be consistent with background and was not identified as a refined COPC.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with subsurface soil.

Groundwater

Twelve inorganics (aluminum, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) exceeded screening values based on maximum detected concentrations in unfiltered sample and also exceeded background values, where available (**Appendix B, Tables B-48** and **B-49**). Only aluminum, iron,

and silver exceeded screening values based on maximum detected concentrations in filtered sample and also exceeded background values, where available. Thus, aluminum, iron, and silver were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The maximum HQ for silver equaled, but did not exceed, 1.0. Thus, silver was not identified as a refined COPC.
- While the mean HQs for aluminum and iron exceeded 1.0 based on undiluted concentrations, the mean HQs did not exceed one when a dilution factor of 10 was applied. Thus, aluminum and iron were not identified as refined COPCs.

No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with groundwater.

6.3 AOC 7 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Analysis and is summarized in **Table 6-4**.

6.3.1 Step 1—Determination of Potential CERCLA Eligibility and, if CERCLA-Eligible, has a CERCLA-Related Release Occurred at the Site?

Historical information indicates the site includes two unlined, non-permitted disposal areas whose date(s) of debris disposal is unknown. Debris identified within the former Drum Disposal Area included empty 55-gallon drums, while debris identified within the Can Pit included amber glass Clorox bottles and 4-inch tall clear bottles buried below the 10-gallon rusted cans with labeling containing the word “tetrachloroethane.”

AOC 7 was listed as a Preliminary Screening Area (PSA) within the FFA. Since VOCs and inorganic constituents were detected above background concentrations during the SI, it is considered to be CERCLA-eligible. AOC 7 is further evaluated in the decision analysis process in Step 2a.

6.3.2 Step 2—Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a—Comparison of Data Against Conservative Risk-Based Screening Values

Specifically, the data for the CERCLA-related constituents detected at AOC 7 are compared to the screening criteria described in Section 1 and exceedances of the screening criteria are identified on **Tables 6-1** through **6-3**. Those constituents that exceed one or more criteria (and background, if available, for inorganics) are shown in **Figures 6-5** through **6-7**.

In summary, before test pitting activities, nine inorganics (aluminum, arsenic, chromium, cobalt, copper, iron, lead, manganese, and zinc) exceeded screening criteria in surface soil and six inorganics (aluminum, arsenic, lead, manganese, selenium, and zinc) exceeded screening criteria in subsurface soil. One VOC (ethylbenzene), 13 total inorganics (aluminum, arsenic, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) and six dissolved inorganics (aluminum, arsenic, chromium, cobalt, iron, and silver) exceeded screening criteria in groundwater.

Step 2b—Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

Human Health Risk Evaluation

Exposure to surface soil at AOC 7 would not be expected to result in any unacceptable human health risks, based on the assumption that chromium is likely present in the trivalent, not the hexavalent, form. In the trivalent form, neither chromium nor arsenic would be considered COPCs. Also, iron is a required human nutrient and any associated adverse effects from exposure are unlikely. Exposure to subsurface soil at AOC 7 also would not be expected to result in any unacceptable human health risks.

Exposure to groundwater at AOC 7 may result in unacceptable human health risks. The risk is associated with ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium detected in the groundwater. However, these risks are primarily associated with the upgradient groundwater sample.

Ecological Risk Evaluation

At AOC 7, potential unacceptable ecological risks were identified with exposure to surface soil attributable to lead, manganese, and zinc. No potential unacceptable ecological risks were identified with exposure to subsurface soil or groundwater.

6.3.3 Step 3—Is Further Investigation or Action Required?

Results from the test pitting activities indicate that buried debris exists within the Can Pit and the vertical and horizontal extent has been sufficiently characterized during test pitting activities. In addition, no buried debris was identified in the area of the former Drum Disposal Area.

Exposure to surface soil at AOC 7 may result in unacceptable human health risks associated with arsenic, chromium, and iron. Potential ecological risks are associated with exposure to lead, manganese, and zinc in surface soil within the former Drum Disposal Area and lead and manganese in surface soil in the Can Pit. There are no potential human health or ecological risks associated with subsurface soil.

An interim removal action is recommended to mitigate surface soil inorganic contamination in the Can Pit and to mitigate inorganic contamination at a localized hotspot within the former Drum Disposal Area surface soil. Post removal samples should be collected and analyzed for inorganics (the exact sample and analyte lists will be determined during the development of the EE/CA and/or work plan for the removal action). In addition, the buried debris with the Can Pit will be removed, as the CAX Tier I Partnering Team assumes that the subsurface debris within the Can Pit presents the potential for future impacts to site media and is, therefore, assumed to pose a potential future risk to human health.

Results from the groundwater sampling indicate potential risks to human health associated with exposure to ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium. However, maximum concentrations were primarily associated with total inorganics and upgradient of the site. An expanded SI for groundwater is recommended for AOC 7 to verify groundwater flow direction and to verify and characterize the extent of ethylbenzene (VOC) and inorganic contamination. Permanent monitoring wells are recommended to determine if there is an actual release to groundwater from inorganics. **Table 6-4** summarizes the results of the decision analysis for AOC 7.

TABLE 6-1
AOC 7 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO01	CAA07-SO02	CAA07-SO03	
Sample ID					CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008
Sample Date					10/29/08	10/29/08	10/29/08	10/29/08
Sample Depth					0-6"	0-6"	0-6"	0-6"
Chemical Name								
Volatile Organic Compounds (UG/KG)								
No Detections								
Semivolatile Organic Compounds (UG/KG)								
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	390 U	**6,700**	380 U	370 U
Phenol	--	1,880	18,000,000	1,800,000	390 U	**420 J**	380 U	370 U
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	--	583	7,200	2,000	3.9 U	**11**	**0.33 J**	3.8 U
4,4'-DDE	--	114	5,100	1,400	3.9 U	**6**	**0.23 J**	3.8 U
4,4'-DDT	--	100	7,000	1,700	3.9 U	**7.7**	**1.7 J**	3.8 U
Aldrin	--	3.63	100	29	2 U	**0.27 J**	1.9 U	1.9 U
alpha-BHC	--	10.5	270	77	**0.28 J**	2.1 U	1.9 U	1.9 U
Dieldrin	--	226	110	30	3.9 U	**0.22 J**	3.8 U	3.8 U
Explosives (UG/KG)								
No Detections								
Total Metals (MG/KG)								
Aluminum	12,200	pH < 5.5	99,000	7,700	**6,710**	**6,620**	**5,880**	**7,190**
Antimony	11	78.0	41	3.1	5.3 UL	52 UL	**0.52 L**	5.2 UL
Arsenic	6.36	18.0	1.6	0.39	**2.5 L**	**23.3 L**	**7.9 L**	**3.7 L**
Barium	52.9	330	19,000	1,500	**55.4**	**36.2**	**43.2**	**48.6**
Beryllium	0.587	40.0	200	16	**0.47**	**0.27 J**	**0.45 J**	**0.56**
Cadmium	1.5	32.0	80	7	**0.06 J**	4.4 U	**2.5 J**	**0.5 J**
Calcium	2,290	--	--	--	**1,910 J**	**1,900 J**	**1,570 J**	**1,190 J**
Chromium	18.2	64.0	5.6	0.29	**8.2 K**	**60.6 K**	**136 K**	**58.1 K**
Cobalt	9.93	13.0	30	2.3	**2.5 J**	**10.3 J**	**5.8 J**	**4.3 J**
Copper	4.25	70.0	4,100	310	**4**	**77.4**	**51 J**	**10.1 J**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**6,410**	**213,000**	**71,100 J**	**20,500 J**
Lead	17.4	120	800	400	**9.8**	**264**	**984**	**486**
Magnesium	1,070	--	--	--	**658**	**728 J**	**564 J**	**638**
Manganese	324	220	2,300	180	**140 L**	**921 L**	**436 L**	**263 L**
Nickel	9.52	38.0	2,000	150	**3.7**	**33.3 J**	**27.5 J**	**8.1 J**
Potassium	708	--	--	--	**606**	**713 J**	**365 J**	**416 J**
Silver	2.1	560	510	39	0.89 U	**2.6 J**	**0.76 J**	**0.11 J**
Sodium	521	--	--	--	**23 J**	**27 J**	**29.5 J**	**23.8 J**
Vanadium	27.9	130	520	39	**12.1**	**15.6 J**	**11.2 J**	**12.2**
Zinc	26.5	120	31,000	2,300	**22.3**	**61.3**	**840**	**388**

TABLE 6-1
AOC 7 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO01	CAA07-SO02	CAA07-SO03	
Sample ID					CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008
Sample Date					10/29/08	10/29/08	10/29/08	10/29/08
Sample Depth					0-6"	0-6"	0-6"	0-6"
Chemical Name								
Wet Chemistry								
% Solids (pct)	--	--	--	--	**84**	**79**	**88**	**89**
pH (ph)	--	--	--	--	**7.3**	**6.7**	**7.1**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**25,000**	**40,000**	**32,000**	NA

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 6-1
AOC 7 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID					CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date					10/30/08	10/30/08	10/31/08	10/31/08
Sample Depth					0-6"	0-6"	0-6"	0-6"
Chemical Name								
Volatile Organic Compounds (UG/KG)								
No Detections								
Semivolatile Organic Compounds (UG/KG)								
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	380 U	390 U	360 U	380 U
Phenol	--	1,880	18,000,000	1,800,000	380 U	390 U	360 U	380 U
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDD	--	583	7,200	2,000	3.9 U	3.9 U	3.7 U	3.9 U
4,4'-DDE	--	114	5,100	1,400	3.9 U	3.9 U	3.7 U	3.9 U
4,4'-DDT	--	100	7,000	1,700	3.9 U	3.9 U	3.7 U	3.9 U
Aldrin	--	3.63	100	29	1.9 U	2 U	1.9 U	1.9 U
alpha-BHC	--	10.5	270	77	1.9 U	2 U	1.9 U	1.9 U
Dieldrin	--	226	110	30	3.9 U	3.9 U	3.7 U	3.9 U
Explosives (UG/KG)								
No Detections								
Total Metals (MG/KG)								
Aluminum	12,200	pH < 5.5	99,000	7,700	**6,810**	**13,000**	**7,400**	**8,220**
Antimony	11	78.0	41	3.1	6.1 UL	6.4 UL	4.6 UL	5.8 UL
Arsenic	6.36	18.0	1.6	0.39	**3.8 L**	**5.1 L**	**2.8 L**	**3.1 L**
Barium	52.9	330	19,000	1,500	**37.5**	**43.6**	**46.5**	**54.9**
Beryllium	0.587	40.0	200	16	**0.65**	**0.57**	**0.62**	**0.6**
Cadmium	1.5	32.0	80	7	0.01 B	0.53 U	**0.04 J**	0.03 B
Calcium	2,290	--	--	--	**409 J**	**1,440**	**1,050 J**	**1,640 J**
Chromium	18.2	64.0	5.6	0.29	**9.7 K**	**17.2**	**7.7 K**	**8.8 K**
Cobalt	9.93	13.0	30	2.3	**2.5 J**	**5 J**	**2.7 J**	**2.8 J**
Copper	4.25	70.0	4,100	310	**3**	**3.4**	**2.9**	**4.1**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**7,660**	**16,200**	**5,830**	**6,280**
Lead	17.4	120	800	400	**11.2**	**10.5**	**9.8**	**12.9**
Magnesium	1,070	--	--	--	**665**	**991 J**	**654**	**767**
Manganese	324	220	2,300	180	**232 L**	**132 L**	**205 L**	**227 L**
Nickel	9.52	38.0	2,000	150	**3.9 J**	**5.9 J**	**4.2**	**4.8**
Potassium	708	--	--	--	**443 J**	**783 J**	**415**	**528**
Silver	2.1	560	510	39	1 U	1.1 U	0.77 U	0.98 U
Sodium	521	--	--	--	12.6 B	**14.8 L**	11.9 B	13.4 B
Vanadium	27.9	130	520	39	**16.5**	**26.5**	**12.2**	**14.5**
Zinc	26.5	120	31,000	2,300	**15.8**	**19.9 L**	**16.8**	**22.8**

TABLE 6-1
AOC 7 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID					CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date					10/30/08	10/30/08	10/31/08	10/31/08
Sample Depth					0-6"	0-6"	0-6"	0-6"
Chemical Name								
Wet Chemistry								
% Solids (pct)	--	--	--	--	**86**	**85**	**90**	**87**
pH (ph)	--	--	--	--	**5.7**	**5.7**	**6.6**	**6.3**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**30,000**	**17,000**	**21,000**	**21,000**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs

Bold indicates detection

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - Analyte not detected

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 6-2
AOC 7 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04
Sample ID					CAA07-SB01-1008	CAA07-SB02-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008
Sample Date					10/29/08	10/29/08	10/29/08	10/29/08	10/30/08
Sample Depth					6-24"	14-16'	6-24"	6-24"	6-24"
Chemical Name									
Volatile Organic Compounds (UG/KG)									
2-Butanone	--	--	20,000,000	2,800,000	11 U	**2 J**	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/KG)									
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	370 U	400 U	350 U	360 U	360 U
Phenol	--	1,880	18,000,000	1,800,000	370 U	400 U	350 U	360 U	360 U
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	--	583	7,200	2,000	3.7 U	**1.4 J**	3.6 U	3.7 U	3.7 U
4,4'-DDE	--	114	5,100	1,400	3.7 U	**0.41 J**	3.6 U	3.7 U	3.7 U
4,4'-DDT	--	100	7,000	1,700	**0.75 J**	**1.3 J**	3.6 U	**0.97 J**	3.7 U
Aldrin	--	3.63	100	29	1.9 U	**0.47 J**	1.8 U	1.9 U	1.9 U
Dieldrin	--	10.5	110	30	3.7 U	**0.55 J**	3.6 U	**0.29 J**	3.7 U
Endrin	--	1.95	18,000	1,800	**0.4 J**	**0.6 J**	3.6 U	**0.33 J**	3.7 U
Endrin aldehyde	--	1.95	18,000	1,800	3.7 U	**0.73 J**	3.6 U	3.7 U	3.7 U
gamma-BHC (Lindane)	--	52.9	2,100	520	1.9 U	**0.29 J**	1.8 U	1.9 U	1.9 U
Heptachlor	--	7.75	380	110	1.9 U	**0.39 J**	1.8 U	**0.25 J**	1.9 U
Explosives (UG/KG)									
Nitroguanidine	--	--	6,200,000	610,000	130 U	120 U	130 U	130 U	**63 J**
Total Metals (MG/KG)									
Aluminum	13,000	pH < 5.5	99,000	7,700	**17,300**	**6,820**	**7,390**	**8,080**	**6,640**
Arsenic	5.54	18.0	1.6	0.39	**5.6 L**	**4.3 L**	**2.3 L**	**2.8 L**	**2.6 L**
Barium	84.5	330	19,000	1,500	**46.4**	**7.7 J**	**45.8**	**47.3**	**50.7**
Beryllium	0.52	40.0	200	16	**0.5**	**0.48**	**0.44**	**0.45**	**0.74**
Cadmium	--	32.0	80	7	0.49 U	**0.06 J**	**0.38**	**0.63**	**0.04 J**
Calcium	2,380	--	--	--	**1,020 J**	**101 J**	**491 J**	**506 J**	**160 J**
Chromium	33.7	64.0	5.6	0.29	**20.6 K**	**23.3 K**	**29.1 K**	**12 K**	**8**
Cobalt	5.18	13.0	30	2.3	**3.4 J**	**2.1 J**	**2.6 J**	**2.8 J**	**2.6 J**
Copper	3.17	70.0	4,100	310	**3**	**5.4**	**2.2**	**5.1**	**2.3**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**18,200**	**16,300**	**6,150**	**11,500**	**5,690**
Lead	8.79	120	800	400	**9.2**	**6.6**	**175 J**	**26.8 J**	**5.5**
Magnesium	1,120	--	--	--	**1,230**	**1,660**	**627**	**668**	**598 J**
Manganese	176	220	2,300	180	**53.6 L**	**30.9 L**	**85.6 L**	**94.8 L**	**270 L**
Mercury	0.14	0.10	31	2.3	0.11 UL	**0.07 L**	0.11 UL	0.086 UL	0.11 U
Nickel	17.6	38.0	2,000	150	**6.2**	**7.9**	**4**	**5.8**	**3.8 J**
Potassium	901	--	--	--	**1,050**	**2,520**	**427**	**452**	**344 J**
Selenium	0.64	0.52	510	39	**0.64 J**	**0.42 J**	2.1 U	2.4 U	2.8 UL
Silver	1.1	560	510	39	0.98 U	**0.12 J**	0.6 U	**0.11 J**	0.8 U
Sodium	811	--	--	--	**38 J**	**537**	**23.2 J**	**25.2 J**	**14.7 J**
Vanadium	48.3	130	520	39	**33.4**	**34.8**	**12**	**13.7**	**9**
Zinc	28	120	31,000	2,300	**18.7**	**23.6**	**235**	**282**	**12.1 L**

TABLE 6-2
AOC 7 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04
Sample ID					CAA07-SB01-1008	CAA07-SB02-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008
Sample Date					10/29/08	10/29/08	10/29/08	10/29/08	10/30/08
Sample Depth					6-24"	14-16'	6-24"	6-24"	6-24"
Chemical Name									
Wet Chemistry									
% Solids (pct)	--	--	--	--	**90**	**82**	**93**	**93**	**93**
pH (ph)	--	--	--	--	**6.6**	**5.8**	**6.7**	NA	**5.3**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**5,800**	**2,400**	**8,800**	NA	**11,000**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs

Bold indicates detection
*Eco exceedance due to pH value
-- - No value available
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 6-2
AOC 7 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO05		CAA07-SO06		CAA07-SO07	
Sample ID					CAA07-SB05-1008	CAA07-SBTP04-1008	CAA07-SB06-1008	CAA07-SBTP06-1008	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date					10/30/08	10/30/08	10/31/08	10/31/08	10/31/08	10/31/08
Sample Depth					6-24"	10'	6-24"	10'	6-24"	10'
Chemical Name										
Volatile Organic Compounds (UG/KG)										
2-Butanone	--	--	20,000,000	2,800,000	12 U	10 U	11 U	10 U	11 U	10 U
Semivolatile Organic Compounds (UG/KG)										
bis(2-Ethylhexyl)phthalate	--	30,000	120,000	35,000	380 U	350 U	**7,400**	340 U	360 U	340 U
Phenol	--	1,880	18,000,000	1,800,000	380 U	350 U	**270 J**	340 U	360 U	340 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	--	583	7,200	2,000	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
4,4'-DDE	--	114	5,100	1,400	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
4,4'-DDT	--	100	7,000	1,700	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Aldrin	--	3.63	100	29	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Dieldrin	--	10.5	110	30	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endrin	--	1.95	18,000	1,800	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endrin aldehyde	--	1.95	18,000	1,800	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
gamma-BHC (Lindane)	--	52.9	2,100	520	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Heptachlor	--	7.75	380	110	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Explosives (UG/KG)										
Nitroguanidine	--	--	6,200,000	610,000	130 U	130 U	130 U	130 U	130 U	130 U
Total Metals (MG/KG)										
Aluminum	13,000	pH < 5.5	99,000	7,700	**22,900***	**5,870**	**9,310**	**6,550**	**8,340**	**6,740**
Arsenic	5.54	18.0	1.6	0.39	**8.1 L**	**3.1 L**	**3 L**	**3.9 L**	**2.4 L**	**2.3 L**
Barium	84.5	330	19,000	1,500	**46.1**	**10.7 J**	**44.5**	**8.2 J**	**44.8**	**8.7 J**
Beryllium	0.52	40.0	200	16	**0.65**	**0.28 J**	**0.52**	**0.29 J**	**0.52**	**0.3 J**
Cadmium	--	32.0	80	7	0.49 U	0.44 U	0.45 U	0.41 U	0.33 U	0.34 U
Calcium	2,380	--	--	--	**1,000**	**73.9 J**	**471 J**	**62.1 J**	**579 J**	**333 J**
Chromium	33.7	64.0	5.6	0.29	**29.3**	**11.7**	**10.8 K**	**13.5 K**	**8.8 K**	**13 K**
Cobalt	5.18	13.0	30	2.3	**5.2 J**	**0.79 J**	**2.8 J**	**0.61 J**	**2.8 J**	**0.66 J**
Copper	3.17	70.0	4,100	310	**3.6**	1.7 B	**2.5**	**2.3**	**2.4**	**1.6 J**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**30,200**	**9,940**	**7,680**	**10,800**	**5,850**	**9,720**
Lead	8.79	120	800	400	**9.8**	**3.6**	**7.2**	**5.5**	**6.4**	**3.5**
Magnesium	1,120	--	--	--	**1,490 J**	**1,070 J**	**761**	**1,150**	**738**	**1,210**
Manganese	176	220	2,300	180	**62 L**	**13.6 L**	**108 L**	**10.8 L**	**104 L**	**12 L**
Mercury	0.14	0.10	31	2.3	**0.04 J**	0.11 U	0.11 UL	0.1 UL	0.11 UL	0.11 UL
Nickel	17.6	38.0	2,000	150	**7.6 J**	**1.8 J**	**4.5**	**1.8 J**	**4.2**	**2 J**
Potassium	901	--	--	--	**1,270 J**	**1,840 J**	**519**	**2,010**	**476**	**2,030**
Selenium	0.64	0.52	510	39	**0.46 L**	3.1 UL	3.2 UL	2.9 UL	2.3 UL	2.4 UL
Silver	1.1	560	510	39	0.98 U	0.88 U	0.9 U	0.82 U	0.66 U	0.68 U
Sodium	811	--	--	--	**30.4 L**	440 UL	12.5 B	7.2 B	15 B	8.1 B
Vanadium	48.3	130	520	39	**44.4**	**14.7**	**16.3**	**18.2**	**12.9**	**14.6**
Zinc	28	120	31,000	2,300	**22.4 L**	**8.2 L**	**14.8**	**7.6**	**11.8**	**8.1**

TABLE 6-2
AOC 7 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA07-SO05		CAA07-SO06		CAA07-SO07	
Sample ID					CAA07-SB05-1008	CAA07-SBTP04-1008	CAA07-SB06-1008	CAA07-SBTP06-1008	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date					10/30/08	10/30/08	10/31/08	10/31/08	10/31/08	10/31/08
Sample Depth					6-24"	10'	6-24"	10'	6-24"	10'
Chemical Name										
Wet Chemistry										
% Solids (pct)	--	--	--	--	**86**	**95**	**92**	**95**	**93**	**95**
pH (ph)	--	--	--	--	**5.2**	**5.1**	**6.2**	**4.8**	**6.1**	**6**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**14,000**	**400 J**	**12,000**	**440**	**8,100**	**160 J**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, ECO & Res RSL
Exceeds BKG, Res & Ind RSLs

Bold indicates detection
*Eco exceedance due to pH value
-- - No value available
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 6-3
AOC 7 Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater (Nov. 2010)	CLEAN RSLs Tapwater Adjusted (Nov. 2010)	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID					CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date					10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Chemical Name									
Volatile Organic Compounds (UG/L)									
Acetone	--	1,500	--	2,200	**2 J**	10 U	10 U	**2 J**	10 U
Ethylbenzene	--	290	700	1.5	**2 J**	10 U	10 U	10 U	10 U
Toluene	--	9.80	1,000	230	**1 J**	10 U	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/L)									
No Detections									
Pesticide/Polychlorinated Biphenyls (UG/L)									
No Detections									
Explosives (UG/L)									
No Detections									
Total Metals (UG/L)									
Aluminum	2,230	87.0	--	3,700	**38,500**	**2,040**	**3,480 J**	**860 J**	**248**
Antimony	18.8	30.0	6	1.5	**14.4 J**	**1 J**	**2.1 J**	**1.1 J**	60 U
Arsenic	2.28	150	10	0.045	**78.9**	7.3 B	**12.8**	6.1 B	4 B
Barium	118	4.00	2,000	730	**109 J**	**36 J**	**38.7 J**	**29.9 J**	**27.5 J**
Beryllium	2.45	0.66	4	7.3	**2.6 J**	5 U	**0.18 J**	5 U	5 U
Cadmium	0.605	0.271	5	1.8	**1.4 J**	0.21 B	**1.5 J**	**0.58 J**	0.34 B
Calcium	169,000	--	--	--	**793,000**	**163,000**	**194,000**	**183,000**	**114,000**
Chromium	15.1	11.4	100	0.043	**167**	**10.2**	**14.2**	**3.3 J**	**1.4 J**
Cobalt	20.6	23.0	--	1.1	**14.9 J**	**1.9 J**	**2.6 J**	1 B	**0.96 J**
Copper	12.2	9.33	1,300	150	**44.8**	**7.5 J**	**4.4 J**	**2.5 J**	**1.4 J**
Iron	894	1,000	--	2,600	**123,000**	**4,280**	**8,060 J**	**1,990 J**	**545**
Lead	21.3	3.18	15	--	**30.7**	3.6 B	4.6 B	1.9 B	1.1 B
Magnesium	11,500	--	--	--	**14,200**	**2,560 J**	**2,940 J**	**2,340 J**	**5,770**
Manganese	57.9	120	--	88	**180**	**44.4**	**83.7**	**39.4**	**16.8**
Nickel	11.4	52.2	--	73	**83**	**5.8 J**	**9.7 J**	**4.3 J**	**11.3 J**
Potassium	12,700	--	--	--	**16,200**	**1,710 J**	**1,940 J**	**1,150 J**	**2,970 J**
Selenium	--	5.00	50	18	**26.9 J**	35 U	35 U	**1.3 J**	35 U
Sodium	64,500	--	--	--	**14,500**	**5,830**	**6,380**	**6,610**	**9,190**
Vanadium	26.2	20.0	--	18	**203**	**7.3 J**	**14.6 J**	**3.6 J**	**0.75 J**
Zinc	4.52	120	--	1,100	**157**	**12.5 J**	**16.2 J**	**9.4 J**	**4.3 J**
Dissolved Metals (UG/L)									
Aluminum, Dissolved	100	87.0	--	3,700	**172 J**	**2,450**	**204**	**209**	**145 J**
Antimony, Dissolved	9.7	30.0	6	1.5	60 U	60 U	60 U	60 U	**0.87 J**
Arsenic, Dissolved	1.37	150	10	0.045	**2.2 J**	7.5 B	3.7 B	4.3 B	3.5 B
Barium, Dissolved	127	4.00	2,000	730	**12.4 J**	**35.6 J**	**26.9 J**	**26.6 J**	**24.9 J**
Calcium, Dissolved	113,000	--	--	--	**132,000**	**163,000**	**158,000**	**161,000**	**106,000**
Chromium, Dissolved	6.04	11.0	100	0.043	**1 J**	**7.3 J**	**0.67 J**	**0.44 J**	**0.71 J**
Cobalt, Dissolved	0.7	23.0	--	1.1	0.44 B	**2.1 J**	0.88 B	0.73 B	0.74 B
Copper, Dissolved	3	8.96	1,300	150	**1.6 J**	**2.7 J**	**1.8 J**	**1.7 J**	**1.4 J**
Iron, Dissolved	275	1,000	--	2,600	**312**	**3,940**	**198**	**191**	**232**
Magnesium, Dissolved	11,200	--	--	--	**2,670 J**	**2,710 J**	**2,120 J**	**2,130 J**	**5,530**

TABLE 6-3
AOC 7 Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG GW YE AQUIFER**	**Eco Surface Water Screening Value - Fresh**	**CLEAN MCL-Groundwater (Nov. 2010)**	**CLEAN RSLs Tapwater Adjusted (Nov. 2010)**	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID					CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date					10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Chemical Name									
Manganese, Dissolved	49.5	120	--	88	**9.4 J**	**39.6**	**40.2**	**32.4**	**13.5 J**
Nickel, Dissolved	12.2	52.0	--	73	**8 J**	**4.8 J**	**3.5 J**	**3.4 J**	**8.8 J**
Potassium, Dissolved	12,600	--	--	--	**1,940 J**	**1,830 J**	**908 J**	**841 J**	**2,840 J**
Silver, Dissolved	--	0.36	--	18	10 U	10 U	10 U	10 U	**0.36 J**
Sodium, Dissolved	62,800	--	--	--	**4,600 J**	**5,940**	**5,720**	**5,800**	**8,360**
Vanadium, Dissolved	4.3	20.0	--	18	**0.66 J**	**8 J**	**0.87 J**	**0.88 J**	**0.53 J**
Zinc, Dissolved	--	118	--	1,100	**6.2 J**	**12.2 J**	**4.8 J**	**3.6 J**	**5 J**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Tapwater RSL
Exceeds BKG, Tapwater RSL & MCL
Exceeds BKG, ECO & Tapwater RSL
Exceeds BKG, ECO & MCL
Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

-- - No value available

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - Analyte not detected

UG/L - Micrograms per liter

TABLE 6-4
AOC 7 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Background or Non-inorganics Detected?	Step 1 Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
AOC 7 Surface Soil	Yes	VOCs	No (no detections)	N/A	N/A	Yes - An interim removal action is recommended to remove buried debris and mitigate surface soil inorganic contamination in the Can Pit and to mitigate inorganic contamination at a localized "hot spot" within the former Drum Disposal Area surface soil. Post removal samples should be collected and analyzed for inorganics (the exact sample and analyte lists will be determined during the development of the EE/CA and/or work plan for the removal action). An expanded SI for groundwater is recommended to verify groundwater flow direction and to verify and characterize the extent of ethylbenzene (VOC) and inorganic contamination. Permanent monitoring wells are recommended. Note: The removal action would mitigate the potential unacceptable HH risk associated with As, Cr, and Fe in surface soil that was identified in Step 2a and eliminated in Step 2b.
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (Al, Co, Fe - potential HH risk; As, Cr, Pb, Mn - potential HH and eco risks; Cu, Zn - potential eco risk)	Yes - 3 inorganics (Pb, Mn, Zn - potential eco risk only)	
AOC 7 Subsurface Soil	Yes	VOCs	Yes	No; however, 2-butanone was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	Yes	No; however, nitroguanidine was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
		Inorganics	Yes	Yes - 6 inorganics (As - potential HH risk; Al, Mn potential HH and eco risks; Pb, Se, Zn - potential eco risk)	No, based on HH and eco risk screenings	
AOC 7 Groundwater	Yes	VOC	Yes	Yes - 1 VOC (ethylbenzene - potential HH risk)	Yes - 1 VOC (ethylbenzene - potential HH risk)	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics (total)	Yes	Yes - 13 total inorganics (As -potential HH risk; Al, Cr, Fe, Pb, Mn, Ni, Se, V - potential HH and eco risks; Be, Cd, Cu, Zn - potential eco risk) and 6 dissolved inorganics (As, Cr, Co - HH qualitative review only[1]; Fe - HH qualitative review[1] and potential eco risk; Al, Ag - potential eco risk)	Yes - 6 total inorganics (Al, As, Cr, Fe, Mn, V - potential HH risk only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

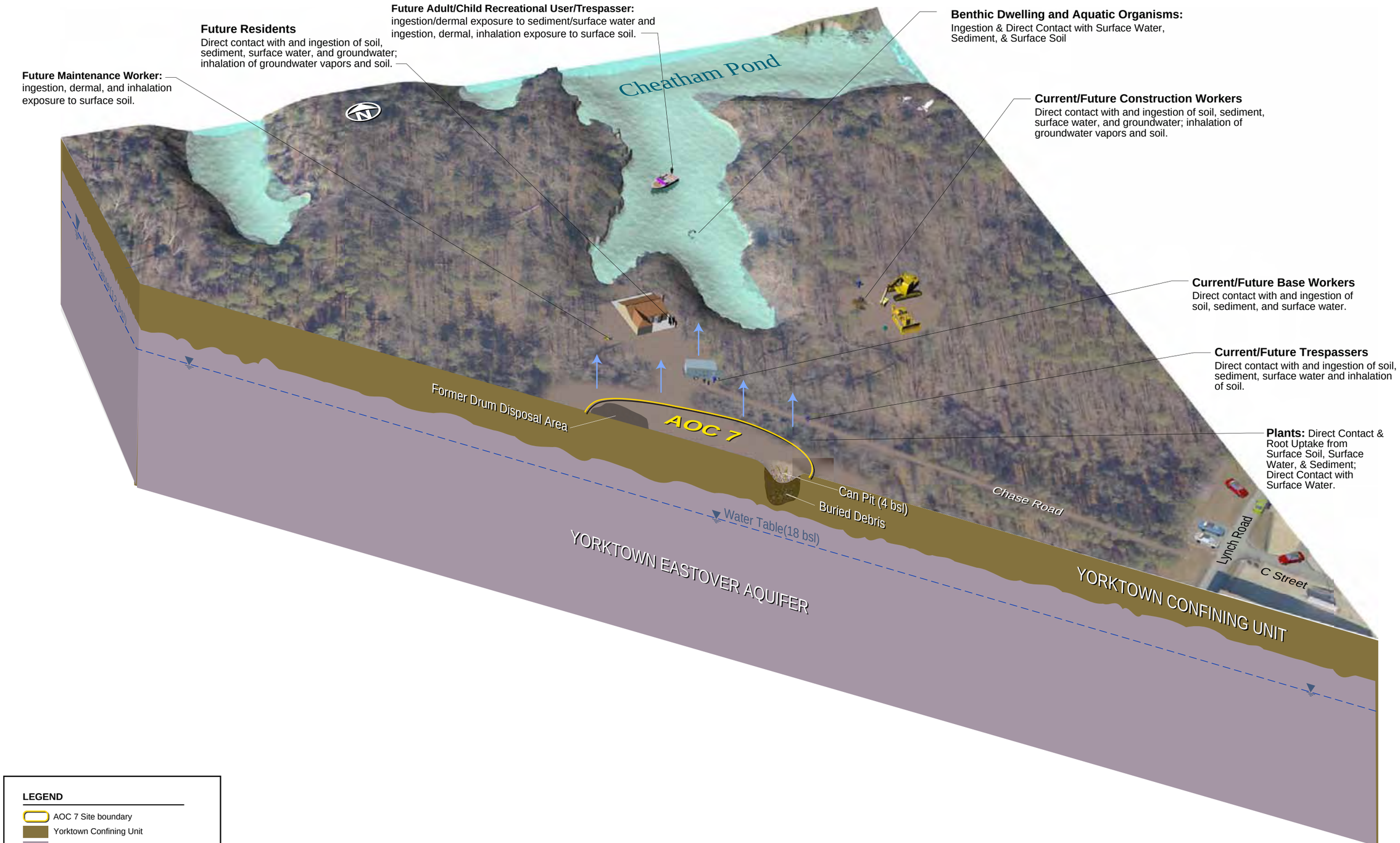
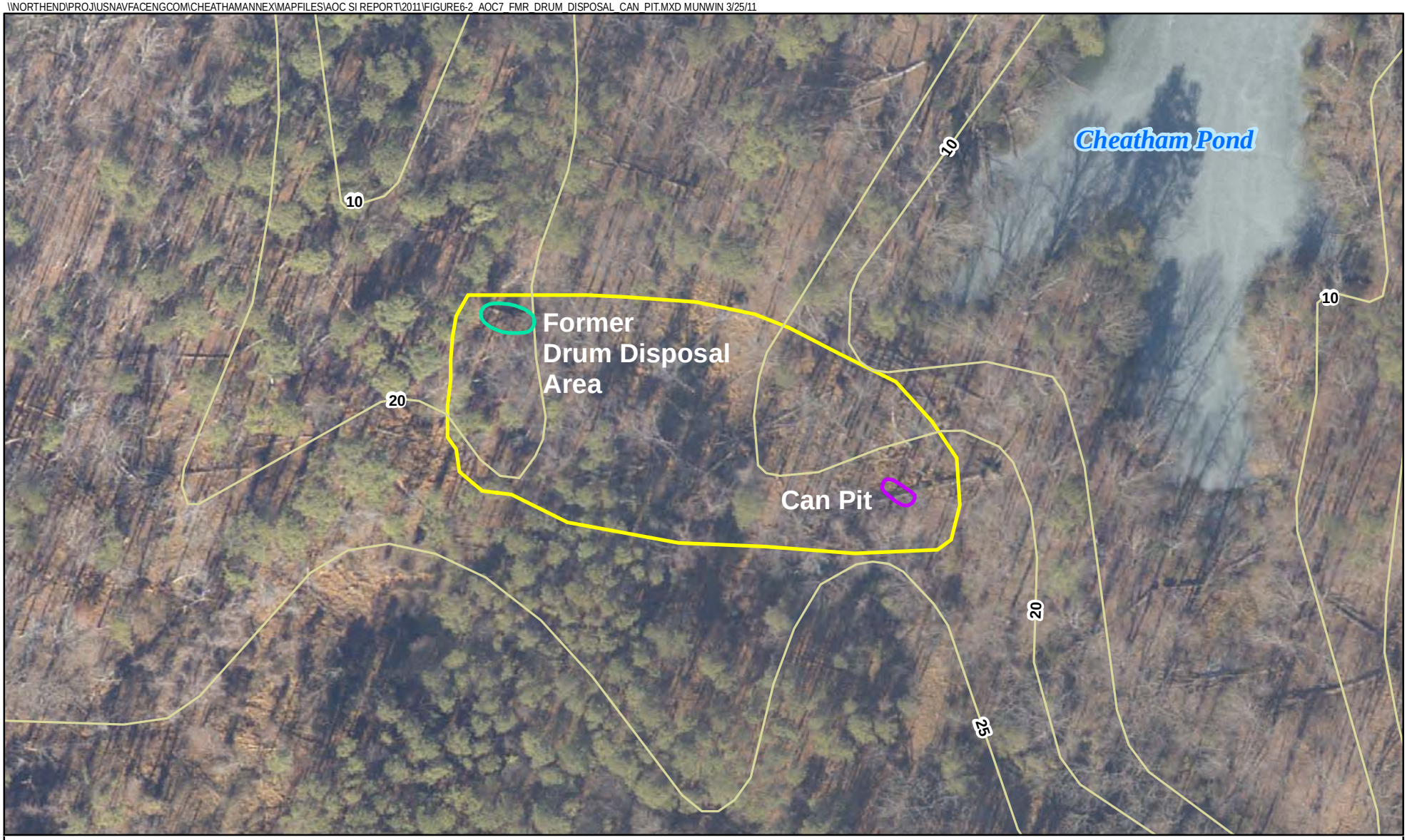


FIGURE 6-1
AOC 7 Conceptual Site Model
Site Inspection Report, Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex,
Williamsburg, Virginia

CH2MHILL

\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE6-2_AOC7_FMR_DRUM_DISPOSAL_CAN_PIT.MXD MUNWIN 3/25/11



Legend

- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-16 feet below ground surface)
- Topographic Surface Contour (feet above mean sea level)

N
W E
S

0 50 100
Feet

Figure 6-2
Former Drum Disposal and Can Pit Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE6-3_AOC7_COMPREHENSIVE_LOCATIONS.MXD JCROCKETT 12/6/2013 7:58:48 AM

Legend

- Groundwater Sample Location
- Groundwater/Soil Sample Location
- Soil Sample Location
- Test Pit
- Topographic Surface Contour (feet above mean sea level)
- Approximate Area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-14 feet below ground surface)
- Approximate AOC 7 Study Area

N
W E
S

0 50 100
Feet

Figure 6-3
AOC 7 Comprehensive Investigation Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE6-4_AOC7_BURIED_DEBRIS_CAN_PIT.MXD JCROCKETT 12/6/2013 8:04:58 AM

Legend

- Test Pit within the Can Pit - Debris Found from (4-14 feet below ground surface)
- Test Pit Outside Can Pit - No Debris Found
- Topographic Surface Contour (feet above mean sea level)
- Approximate Extent of Buried Debris within the Can Pit (4-14 feet below ground surface)
- Approximate AOC 7 Study Area

N
W E
S

0 10 20
Feet

Figure 6-4
Extent of Buried Debris within the Can Pit
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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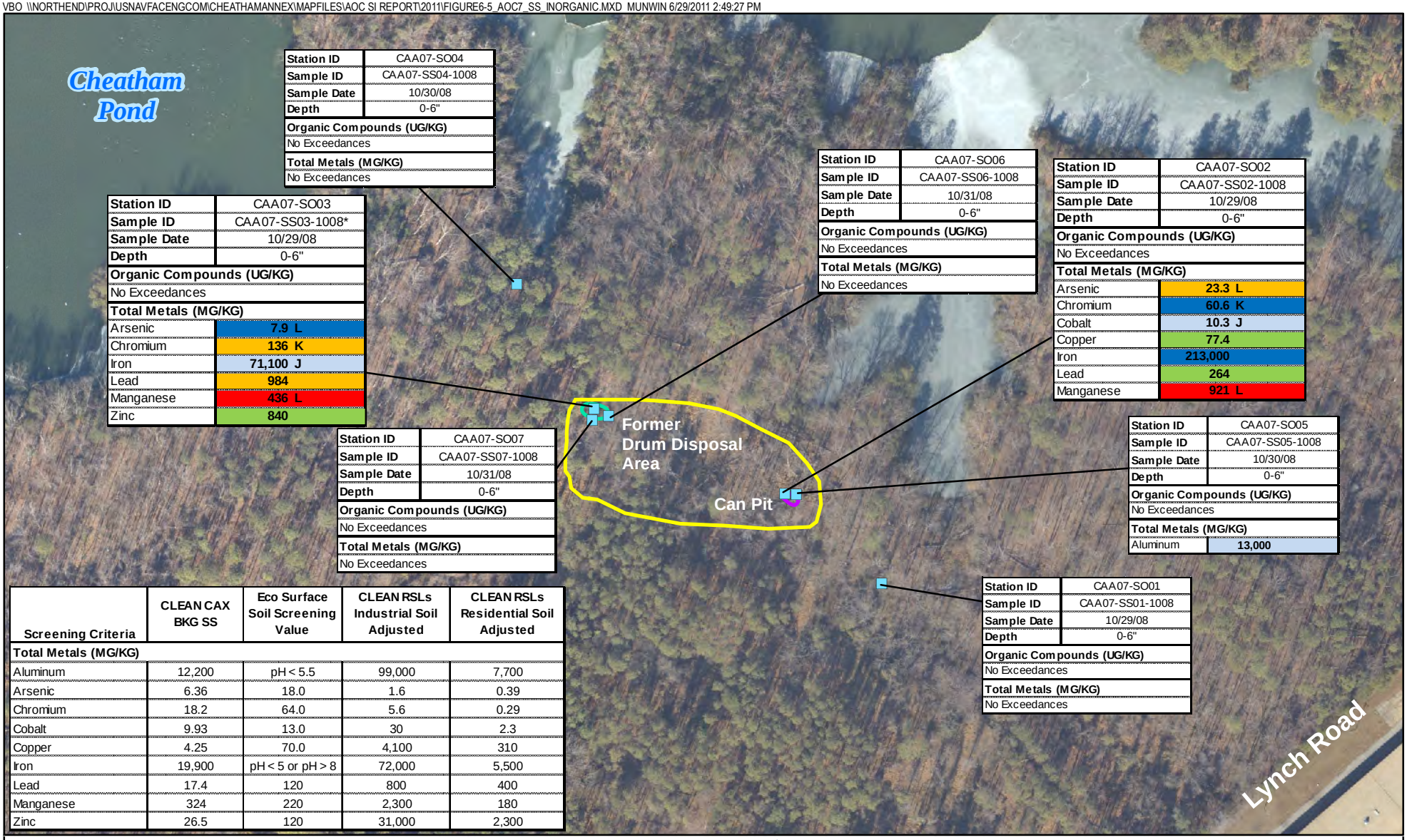
VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE6-5_AOC7_SS_INORGANIC.MXD MUNWIN 6/29/2011 2:49:27 PM



Station ID	CAA07-SO04
Sample ID	CAA07-SS04-1008
Sample Date	10/30/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA07-SO03
Sample ID	CAA07-SS03-1008*
Sample Date	10/29/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	7.9 L
Chromium	136 K
Iron	71,100 J
Lead	984
Manganese	436 L
Zinc	840

Station ID	CAA07-SO06
Sample ID	CAA07-SS06-1008
Sample Date	10/31/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA07-SO02
Sample ID	CAA07-SS02-1008
Sample Date	10/29/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Arsenic	23.3 L
Chromium	60.6 K
Cobalt	10.3 J
Copper	77.4
Iron	213,000
Lead	264
Manganese	921 L

Station ID	CAA07-SO07
Sample ID	CAA07-SS07-1008
Sample Date	10/31/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA07-SO05
Sample ID	CAA07-SS05-1008
Sample Date	10/30/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	13,000

Station ID	CAA07-SO01
Sample ID	CAA07-SS01-1008
Sample Date	10/29/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Screening Criteria	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Cobalt	9.93	13.0	30	2.3
Copper	4.25	70.0	4,100	310
Iron	19,900	pH < 5 or pH > 8	72,000	5,500
Lead	17.4	120	800	400
Manganese	324	220	2,300	180
Zinc	26.5	120	31,000	2,300

Legend

- Soil Sample Location
- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-16 feet below ground surface)

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO & Res RSL
- Exceeds BKG, RES & Ind RSLa
- Exceeds BKG, ECO, Res & Ind RSLs

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

N W E S

0 100 200 Feet

Figure 6-5
AOC 7 Surface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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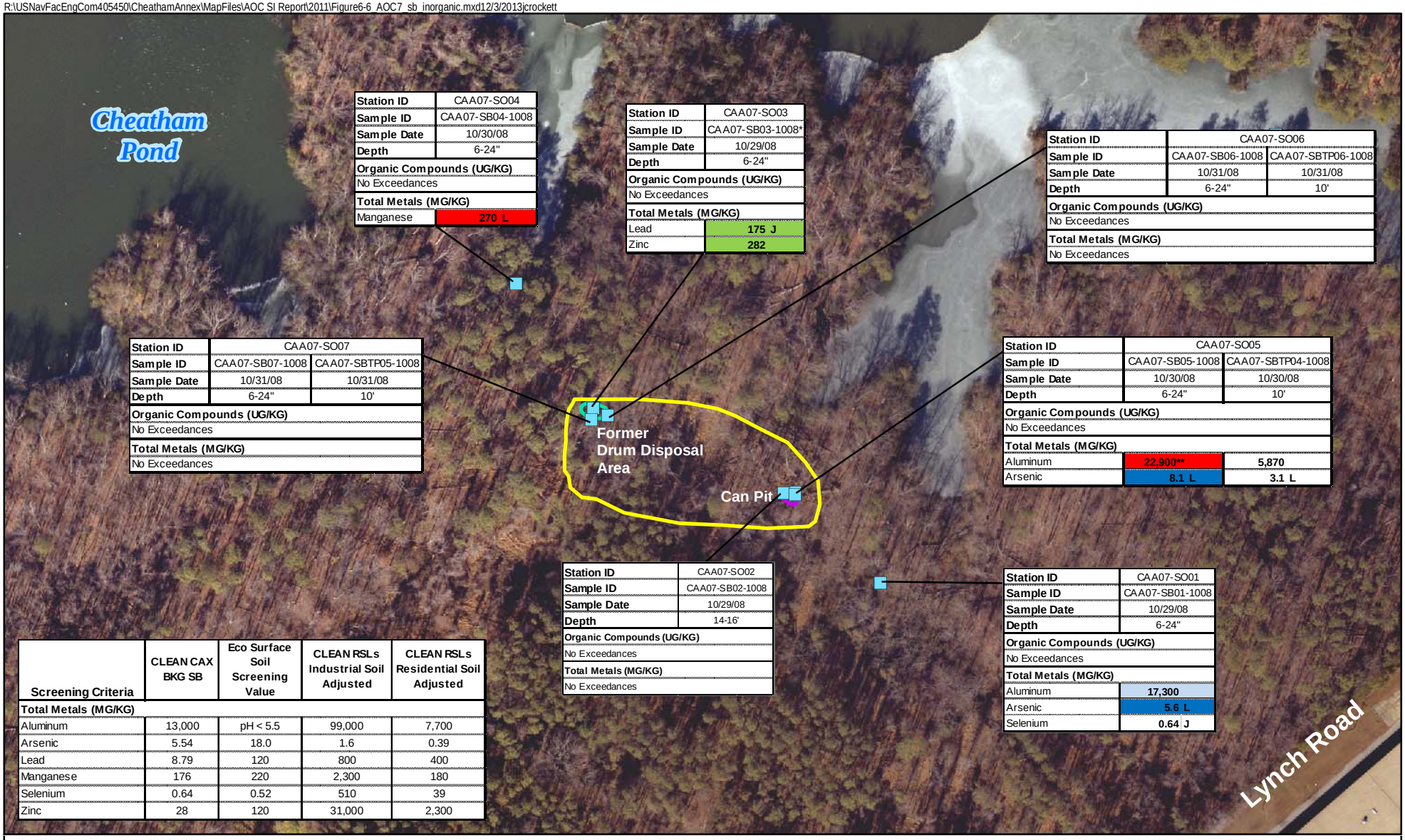

Station ID	CAA07-SO04
Sample ID	CAA07-SB04-1008
Sample Date	10/30/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Manganese	**270 L**

Station ID	CAA07-SO03
Sample ID	CAA07-SB03-1008*
Sample Date	10/29/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Lead	**175 J**
Zinc	**282**

Station ID	CAA07-SO06	
Sample ID	CAA07-SB06-1008	CAA07-SBTP06-1008
Sample Date	10/31/08	10/31/08
Depth	6-24"	10'
Organic Compounds (UG/KG)		
No Exceedances		
Total Metals (MG/KG)		
No Exceedances		

Station ID	CAA07-SO07	
Sample ID	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date	10/31/08	10/31/08
Depth	6-24"	10'
Organic Compounds (UG/KG)		
No Exceedances		
Total Metals (MG/KG)		
No Exceedances		

Station ID	CAA07-SO05	
Sample ID	CAA07-SB05-1008	CAA07-SBTP04-1008
Sample Date	10/30/08	10/30/08
Depth	6-24"	10'
Organic Compounds (UG/KG)		
No Exceedances		
Total Metals (MG/KG)		
Aluminum	**22,900****	**5,870**
Arsenic	**8.1 L**	**3.1 L**

Station ID	CAA07-SO02
Sample ID	CAA07-SB02-1008
Sample Date	10/29/08
Depth	14-16'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA07-SO01
Sample ID	CAA07-SB01-1008
Sample Date	10/29/08
Depth	6-24"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	**17,300**
Arsenic	**5.6 L**
Selenium	**0.64 J**

Screening Criteria	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Arsenic	5.54	18.0	1.6	0.39
Lead	8.79	120	800	400
Manganese	176	220	2,300	180
Selenium	0.64	0.52	510	39
Zinc	28	120	31,000	2,300

Legend

- Soil Sample Location
- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-14 feet below ground surface)

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO & Res RSL
- Exceeds BKG, Res & Ind RSLs

Bold indicates detection
Samples collected at a depth greater than 2 feet below ground surface were not included in the ecological risk screening.
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
**Eco exceedance due to pH value
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
MG/KG - Milligrams per kilogram

N W E S

0 100 200 Feet

Figure 6-6
AOC 7 Subsurface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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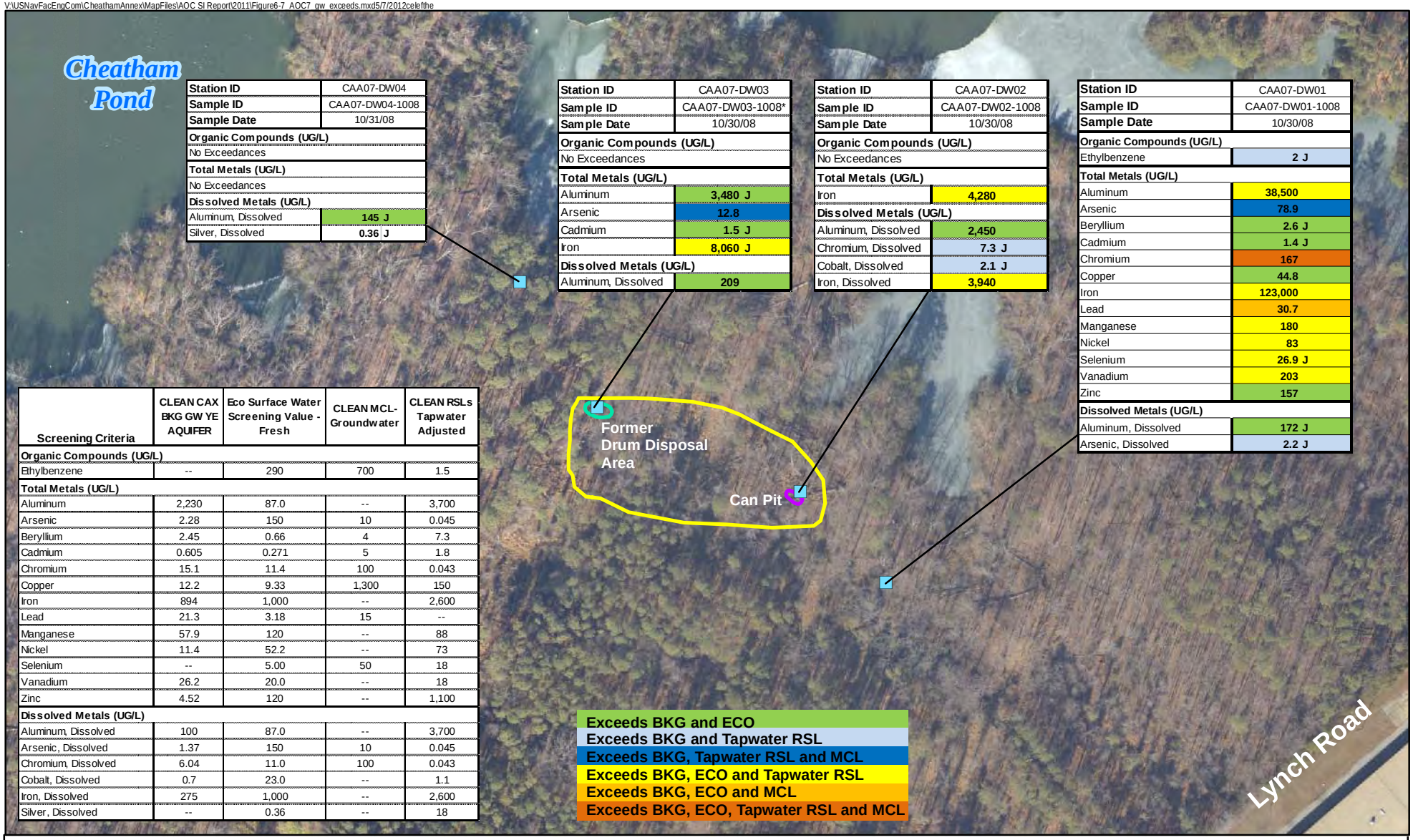

Station ID	CAA07-DW04
Sample ID	CAA07-DW04-1008
Sample Date	10/31/08
Organic Compounds (UG/L)	
No Exceedances	
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**145 J**
Silver, Dissolved	**0.36 J**

Station ID	CAA07-DW03
Sample ID	CAA07-DW03-1008*
Sample Date	10/30/08
Organic Compounds (UG/L)	
No Exceedances	
Total Metals (UG/L)	
Aluminum	**3,480 J**
Arsenic	**12.8**
Cadmium	**1.5 J**
Iron	**8,060 J**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**209**

Station ID	CAA07-DW02
Sample ID	CAA07-DW02-1008
Sample Date	10/30/08
Organic Compounds (UG/L)	
No Exceedances	
Total Metals (UG/L)	
Iron	**4,280**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**2,450**
Chromium, Dissolved	**7.3 J**
Cobalt, Dissolved	**2.1 J**
Iron, Dissolved	**3,940**

Station ID	CAA07-DW01
Sample ID	CAA07-DW01-1008
Sample Date	10/30/08
Organic Compounds (UG/L)	
Ethylbenzene	**2 J**
Total Metals (UG/L)	
Aluminum	**38,500**
Arsenic	**78.9**
Beryllium	**2.6 J**
Cadmium	**1.4 J**
Chromium	**167**
Copper	**44.8**
Iron	**123,000**
Lead	**30.7**
Manganese	**180**
Nickel	**83**
Selenium	**26.9 J**
Vanadium	**203**
Zinc	**157**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**172 J**
Arsenic, Dissolved	**2.2 J**

Screening Criteria	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Organic Compounds (UG/L)				
Ethylbenzene	--	290	700	1.5
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Beryllium	2.45	0.66	4	7.3
Cadmium	0.605	0.271	5	1.8
Chromium	15.1	11.4	100	0.043
Copper	12.2	9.33	1,300	150
Iron	894	1,000	--	2,600
Lead	21.3	3.18	15	--
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Selenium	--	5.00	50	18
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Arsenic, Dissolved	1.37	150	10	0.045
Chromium, Dissolved	6.04	11.0	100	0.043
Cobalt, Dissolved	0.7	23.0	--	1.1
Iron, Dissolved	275	1,000	--	2,600
Silver, Dissolved	--	0.36	--	18

Exceeds BKG and ECO
Exceeds BKG and Tapwater RSL
Exceeds BKG, Tapwater RSL and MCL
Exceeds BKG, ECO and Tapwater RSL
Exceeds BKG, ECO and MCL
Exceeds BKG, ECO, Tapwater RSL and MCL

Legend

- Groundwater/Soil Sample Location
- Approximate AOC 7 Study Area
- Approximate area of the Former Drum Disposal Area
- Approximate Extent of Buried Debris within the Can Pit (4-16 feet below ground surface)

Notes:
Bold indicates detection
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.
-- No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

N
W E
S

0 100 200 Feet

Figure 6-7
AOC 7 Groundwater Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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SECTION 7

AOC 8—Area South of Site 7

This section presents an evaluation of the results from the SI performed at AOC 8. This section includes a summary of the previous investigations conducted at the site, the CSM, and the release assessment decision analysis.

7.1 History of Investigations

The following investigations were previously conducted and documented at AOC 8:

- Final Field Investigation Report, Site 7 and AOC 2, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Annex (Baker, 2001b)

7.2 Conceptual Site Model

The CSM for AOC 8 is based on data collected as part of previous investigations and the SI. The CSM interprets the physical characteristics, the distribution of contamination and potential contaminant source, potential migration pathways, and the potential exposure and receptor pathways. The CSM for AOC 8 is shown in **Figure 7-1**.

7.2.1 Site History and Potential Sources of Release

AOC 8 is approximately 1.5 acres in size and located within a bermed area along the York River, northeast of the intersection of Chase and Lynch Roads (**Figure 7-2**). The site consists of surface and buried debris, with gravel and ballast rock on the ground surface. In a small area in the eastern portion of the site, buried debris (pipe, metal, and wood) can be seen outcropping from the edge of the slope.

1999 Field Investigation

AOC 8 was previously thought to be the location of Environmental Restoration Site 7, the Old DuPont Disposal Area, and was investigated as such during the 1999 field investigation. This investigation included the excavation of 10 test pits to define the lateral extent of buried debris at the site. In addition, one sample (identified as a sediment sample) was collected from the low lying area east of where buried debris was encountered. The sample was collected because this area receives runoff from the site and is adjacent to a slope where debris outcrops; the sample was analyzed for VOCs, SVOCs, pesticides, PCBs, nitramines/nitroaromatics, and inorganics. Analytical results indicated the presence of Aroclor-1260 (540L µg/kg) and arsenic (5.9 mg/kg) at concentrations exceeding the residential soil RSL (**Appendix G**, **Tables G-18** and **G-19**)

The debris found within the test pits (for example, Styrofoam, a candy wrapper with a UPC bar code, and one spent 75-millimeter [mm] salute round) indicated disposal was more recent than WWI era, suggesting this disposal area is not related to the PSLP, which ceased operations shortly after WWI (Baker, 2001b). Site 7 was later located approximately 500 feet north of this site; thus, this area was re-designated as AOC 8. During this investigation, the vertical extent of debris was estimated at 7 feet bgs. However, since the horizontal extent of the debris was not determined an additional investigation was recommended.

2008 Site Inspection Activities

AOC 8 investigation activities included test pit excavation with surface and subsurface soil sampling and DPT surface soil, subsurface soil, and groundwater sampling. An explanation for each activity and methods of sample collection are documented in **Section 2**.

7.2.2 Physical Setting

Topography and Surface Water

In general, the topography of AOC 8 is a flat, sparsely vegetated depression within a bermed area next to the York River (**Figure 7-2**). The berms along the northern and southern edges of AOC 8 are approximately 5 feet high. The berm along the York River is approximately 10 feet high.

Surface runoff from the area surrounding AOC 8 is anticipated to flow towards the York River; however, the bermed area may temporarily retain water following precipitation events.

Hydrogeology

In general, soil at AOC 8 is predominantly olive yellow silty sand and brown sandy clay. Soil boring logs from the SI field activities present descriptions of the soil and general subsurface geology and are included as **Appendix C**.

The first encountered groundwater underlying AOC 8 is the Yorktown-Eastover Aquifer and was encountered between 5 and 15 feet bgs. Groundwater is expected to flow east-northeast toward the York River, which is the nearest open-water body to AOC 8.

Current and Future Land Use

AOC 8 is within the confines of CAX and access is restricted to the general public. Navy and DoD personnel do have access to AOC 8. It is currently a sparsely vegetated area, with no specified designated use. Future land use at AOC 8 is not expected to change and will likely continue as unzoned use for the foreseeable future.

7.2.3 Distribution of Contamination

Data collected during the 2008 SI field activities were evaluated as part of this SI report (**Figure 7-3**). While historical buried debris data were collected, the results were not evaluated in this SI because test pitting during the 2008 SI overlapped the test pitting activities conducted in 1999. In addition, the sediment sample collected during the 1999 field activities was not used in evaluating the extent of contamination or risk associated with AOC 8 because it could not be confirmed that it was a sediment sample.

Tables 7-1 through **Table 7-3** summarize all constituents detected in AOC 8 soil and groundwater. No sediment or surface water is associated with AOC 8. All analytical data for the SI samples are provided in **Appendix H**.

Debris

Test pitting activities were conducted in October 2008 to determine the extent of buried debris at AOC 8. Test pits were located based on existing test pit data (Baker, 2001b), visible debris on the ground surface, and magnetometer readings taken across the site. Twenty-seven test pits were excavated across the entire site, but were positioned primarily in the vicinity of visible surface debris (**Figure 7-3**). Since the results of the 1999 Field Investigation indicated that the vertical extent of buried debris was approximately 7 feet bgs, test pits were initially advanced to a maximum depth of 10 feet bgs or until native soil was encountered. However, during the 2008 field activities, it was determined that the vertical extent of debris was deeper than 7 feet bgs. On October 24, 2008, test pitting excavation activities were amended to continue to the depth at which debris ended or to 20 feet bgs, the maximum extent of the excavator's reach. Several test pits were re-excavated following this amendment.

Two areas of buried debris were encountered at AOC 8 (**Figure 7-4**). One area is located immediately south of the site entrance road and consisted of metal wire and cable to a depth of approximately 2 feet bgs. Test pitting activities did not confirm the horizontal extent of buried debris; however it is assumed that no buried debris exists outside the soil berm.

The second buried debris area is located at the end of the site entrance road (**Figure 7-4**). Shallow buried debris in this area was encountered to an approximate depth of 6 feet bgs and consisted primarily of wood, concrete, glass, plexiglass, various metal debris (wire, piping, fencing, bars, rods, chains), and construction debris (bricks, burned and unburned wood, nails, burlap, plexiglass shards). In addition, a chalky blue powder was also observed in two test pits (TP18 and TP21) to a depth of approximately 6 feet bgs. Clean fill soil was subsequently observed below the shallow buried debris; however, deeper buried debris, including scrap metal and steel cylinders were encountered at approximately 15 feet bgs. This deeper debris extended past the reach of the backhoe in some locations and is therefore assumed to be at depths greater than 20 feet bgs.

A detailed summary of the AOC 8 test pitting activities is included in **Appendix J**. The horizontal extent of buried debris at AOC 8 is depicted in **Figure 7-4**.

Soil

Nine surface soil (0-6 inches) and shallow subsurface soil (6-24 inches) samples were collected as part of the 2008 SI field activities (**Table 2-1**). In addition, three deep subsurface soil samples (20 feet bgs) were collected from the bottom of three test pits at AOC 8 (**Figure 7-3**). These locations were positioned to determine if a release occurred from debris encountered at AOC 8 and to characterize potential migration pathways.

All surface and subsurface soil samples were analyzed for VOCs, SVOCs, inorganics, cyanide, explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine), TOC, and pH. The soil analytical results are listed in **Tables 7-1 and 7-2**, and the exceedances are shown on **Figures 7-5 and 7-6**.

VOCs, SVOCs, Pesticides, PCBs and Explosives

One SVOC (benzo(b)fluoranthene), one PCB (Aroclor-1260), and one pesticide (endrin aldehyde) were detected above screening criteria in surface soil (**Figure 7-5**), and one PCB (Aroclor-1260) and one pesticide (endrin aldehyde) were detected above screening criteria in subsurface soil (**Figure 7-6**). VOCs and explosives were not detected above screening criteria in surface soil, and VOCs, explosives, and SVOCs were not detected above screening criteria in subsurface soil.

- Benzo(b)fluoranthene was detected in only two surface soil samples (270J and 290J µg/kg) above the Residential RSL (150 µg/kg), within the extent of the buried debris. However, benzo(b)fluoranthene was not detected in co-located shallow subsurface soil samples (SB04 and SB08) and in groundwater. PAHs tend to adsorb to clay and are not readily mobile.
- Aroclor-1260 was detected above screening criteria in soil at two locations within the extent of the buried debris. At sample location SO04, Aroclor-1260 was detected above the Residential RSL (220 µg/kg) in the surface soil sample (420 µg/kg), shallow subsurface soil sample (500J µg/kg), and deep subsurface soil sample at a depth of 20 feet bgs (400 µg/kg). At sample location SO05, Aroclor-1260 was detected in the subsurface soil sample (depth of 20 feet bgs) with a concentration of 26,000J µg/kg, above the Residential RSL. In both of these areas, debris was encountered to a depth of 20 feet bgs. However, PCBs were not detected in groundwater.
- Endrin aldehyde exceeded the ecological screening level (1.95 µg/kg) in three surface soil samples (SS04, SS06, and SS08) and one subsurface soil sample (SB04) at a maximum concentration of 24J µg/kg. However, the low level concentrations (all less than 50 µg/kg) are likely attributable to routine basewide pesticide application.

Inorganic Constituents

Five inorganics (arsenic, chromium, selenium, thallium, and zinc) exceeded background concentrations and at least one screening criterion in surface soil (**Figure 7-5**).

- The maximum concentrations of arsenic (15.4K mg/kg), chromium (26.5 mg/kg), selenium (0.6J mg/kg), and zinc (160 mg/kg) exceeded their respective base background UTLs (6.4 mg/kg, 18.2 mg/kg, 0.5 mg/kg, and 26.5 mg/kg).

Only one inorganic (arsenic) exceeded its background UTL and screening criteria in two subsurface soil samples (**Figure 7-6**).

Groundwater

Groundwater samples were collected from four DPT locations (DW01 through DW04) during the 2008 SI field activities (**Table 2-1**). Since no groundwater samples had previously been collected from AOC 8, the sample locations were positioned in areas with the highest potential of contamination (within the extent of buried debris), upgradient, and potentially downgradient of the site (**Figure 7-3**).

All groundwater samples were submitted for analysis of VOCs, SVOCs, pesticides, PCBs, inorganics (total and dissolved), cyanide, and explosives (including PETN, 3,5-dinitroaniline, nitroglycerin, and nitroguanadine). The groundwater analytical results are listed in **Table 7-3** and the exceedances are shown on **Figure 7-7**.

VOCs, SVOCs, Pesticides, PCBs and Explosives

One VOC (tetrachloroethene [PCE]), exceeded the adjusted Tapwater RSL (0.11 µg/L) and the MCL (5 µg/L) at a concentration of 7J µg/L (**Figure 7-7**). No other VOCs, SVOCs, pesticides, PCBs, or explosives were detected in groundwater.

Inorganic Constituents

Three total inorganics (arsenic, iron, and manganese) and six dissolved inorganics (aluminum, arsenic, cobalt, iron, thallium, and manganese) exceeded at least one screening criterion in groundwater (**Figure 7-7**).

- Total and dissolved arsenic, iron, and manganese concentrations were detected above background concentrations and screening criteria in only one groundwater sample (DW04). Arsenic, iron, and manganese are commonly associated with chemical weathering of volcanic rocks.
- Dissolved aluminum and cobalt were the most frequently detected inorganic constituents at AOC 8, exceeding a screening criterion in three of the four groundwater samples. The maximum dissolved aluminum concentration of 140J µg/L slightly exceeded its background UTL of 100 µg/L and is likely attributable to natural background conditions. The maximum dissolved cobalt concentration of 5.2J µg/L exceeded its background UTL of 0.7 µg/L and Tap Water RSL of 1.1 µg/L and may be attributable to a release.

7.2.4 Potential Exposure and Receptor Pathways

Potential receptors at AOC 8 include current/future recreational users/visitors, trespassers, maintenance workers, and industrial workers; future residents and construction workers; and lower trophic level terrestrial receptors (plants and soil invertebrates).

Human Health Risk Evaluation

The HHRS for AOC 8 is presented in **Appendix A**. The supporting tables for the evaluation are presented in **Appendix A**, **Attachment A.5**. An overview of the various potential receptors and exposure pathways for the site is presented in **Figure A-1** of **Appendix A**. The results of the evaluation for AOC 8 are summarized as follows.

Surface Soil

The risk-based screening for surface soil at AOC 8 is provided in **Appendix A, Attachment A.5, Tables 2.1** through **2.1b**.

- In Step 1, four constituents were detected in surface soil samples at concentrations above background (for PAHs, PCBs, and inorganics) and the human health screening levels, and were identified as COPCs—benzo(b)fluoranthene, Aroclor-1260, arsenic, and chromium.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 1×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Constituents contributing to the cumulative cancer risk were identified as COPCs and include benzo(b)fluoranthene, Aroclor-1260, arsenic, and chromium.
- In Step 3, based on the use of the 95 percent UCL for the EPCs, a cumulative cancer risk of 1×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Constituents contributing to the cumulative cancer risk were selected as COPCs and include benzo(b)fluoranthene, Aroclor-1260, arsenic, and chromium.

Exposure to surface soil at AOC 8 may result in unacceptable human health risks associated with benzo(b)fluoranthene, Aroclor-1260, arsenic, and chromium. The potential unacceptable carcinogenic risk is primarily associated with chromium, the only COPC which alone contributes a risk above the screening benchmark level. However, in performing the risk screening, it was assumed that all of the chromium detected in the soil is in the hexavalent form, which is very unlikely. Chromium is generally found in natural soil in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. Therefore, trivalent chromium is the form of chromium expected to be present at the site. Chromium was identified as a COPC in soil

when screened against the respective RSLs for hexavalent chromium. However, the maximum detected concentration for chromium in soil was less than the RSL for trivalent chromium. Therefore, it is likely there would be no unacceptable carcinogenic risk associated with exposure to the surface soil.

There were no residential or industrial soil RSL values for thallium when the AOC 8 HH screen was originally prepared, and thallium was not detected in the background data set. However, with the June 2011 RSL table update, which became available while the draft document was undergoing regulator review, RSLs have been established for thallium, so a comparison to these values was made[14]. Thallium was detected in two of the nine surface soil samples at concentrations of 0.06 J mg/kg and 0.08 J mg/kg. The maximum concentration slightly exceeds the adjusted residential soil RSL of 0.078 mg/kg, but not the unadjusted residential soil RSL (0.78 mg/kg). This concentration does not exceed the adjusted industrial soil RSL of 1 mg/kg (or the unadjusted industrial soil RSL of 10 mg/kg).

Subsurface Soil

The risk-based screening for subsurface soil at AOC 8 is provided in **Appendix A**, **Attachment A.5**, **Tables 2.2** through **2.2a**.

- In Step 1, two constituents were detected in subsurface soil samples at concentrations above background (for PCBs and inorganics) and the human health screening levels, and were identified as COPCs—Aroclor-1260 and arsenic.
- In Step 2, based on the maximum detected concentration for each COPC, a cumulative cancer risk of 2×10^{-5} was calculated; this value is less than the 5×10^{-5} risk-ratio screening benchmark.

Exposure to subsurface soil at AOC 8 is not expected to result in any unacceptable human health risks.

Groundwater

The risk-based screening for groundwater at AOC 8 is provided in **Appendix A**, **Attachment A.5**, **Tables 2.3** and **2.3a**.

- In Step 1, four constituents were detected in groundwater samples above background (for inorganics) and the human health screening levels, and were identified as COPCs—PCE, arsenic, iron, and manganese.
- In Step 2, based on the use the maximum detected concentration for each COPC, a cumulative cancer risk of 4×10^{-4} was calculated; this value is greater than the 5×10^{-5} risk-ratio screening benchmark. Cumulative target organ HIs calculated for the COPCs were 0.3; this HI value was less than the cumulative target organ HI risk-ratio screening benchmark of 0.5. Constituents contributing to the cumulative cancer risk were identified as COPCs and include PCE and arsenic.
- Step 3 was not performed because less than 5 samples were available for groundwater.

Exposure to groundwater at AOC 8 may result in unacceptable human health risks, associated with PCE and arsenic. PCE was detected in only one sample; the result was J-qualified meaning detected below the reporting limit.

Ecological Risk Evaluation

The results of the risk evaluation for AOC 8 are presented in **Tables B-50** through **B-55** of **Appendix B**.

Surface Soil

Four inorganics (aluminum, iron, selenium, and zinc) and one organic (endrin aldehyde) exceeded screening values based upon either maximum detected concentrations or pH; however, aluminum and iron did not exceeded background values (**Appendix B, Tables B-50** and **B-51**). Screening values were not available for acetone

[14]The AOC 8 risk screen was not re-run with the June 2011 RSLs; only a comparison of results against the new thallium RSLs was conducted.

and benzaldehyde. Thus, selenium, zinc, endrin aldehyde, acetone, and benzaldehyde were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Benzaldehyde, which did not have a screening value, was detected at a maximum concentration of 180 µg/kg. This maximum concentration was compared with the range of soil screening values for all other SVOCs (not including atrazine, a herbicide) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 380 to 40,000 µg/kg. The maximum site concentration of benzaldehyde was less than the soil screening values for these other SVOCs. Thus, this constituent was not identified as a refined COPC.
- Acetone, which did not have a screening value, was detected at a maximum concentration of 36.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 173 to 64,000 µg/kg. The maximum site concentration of acetone was less than the soil screening values for these other VOCs. Thus, acetone was not identified as a refined COPC.
- The mean HQ for zinc was less than 1.0. Thus, zinc was not identified as a refined COPC.
- Selenium exceeded its screening value and background value in just one of nine samples at a maximum HQ of 1.15 (maximum ratio to the background value of 1.18). Based upon the low magnitude and frequency of these exceedances, selenium was not identified as a refined COPC.
- The mean HQ exceeded 1.0 for endrin aldehyde (2.80); this constituent was identified as a refined COPC.

Subsurface Soil

Endrin aldehyde was the only constituent that exceeded screening values based upon maximum detected concentrations and also exceeded background values, where available (**Appendix B, Tables B-52** and **B-53**). A screening value was not available for 2-butanone. Thus, endrin aldehyde and 2-butanone were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 2-Butanone, which did not have a screening value, was detected at a maximum concentration of 2.00 µg/kg. This maximum concentration was compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 173 to 64,000 µg/kg. The maximum site concentration of 2-butanone was less than the soil screening values for these other VOCs. Thus, this constituent was not identified as a refined COPC.
- The mean HQ exceeded 1.0 for endrin aldehyde (2.05); this constituent was identified as a refined COPC.

Groundwater

Two inorganics (iron and manganese) exceeded screening values based on maximum detected concentrations in unfiltered sample and also exceeded background values, where available (**Appendix B, Tables B-54** and **B-55**). Aluminum, iron, and manganese exceeded screening values based on maximum detected concentrations in filtered sample and also exceeded background values, where available. Thus, aluminum, iron, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The maximum HQ for manganese did not exceed 1.0. Thus, manganese was not identified as a refined COPC.
- While the mean HQs for aluminum and iron exceeded 1.0 based on undiluted concentrations, the mean HQs did not exceed one when a dilution factor of 10 was applied. Thus, aluminum and iron were not identified as refined COPCs. No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with groundwater.

7.3 AOC 8 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Analysis and is summarized in **Table 7-4**.

7.3.1 Step 1: Determination of Potential CERCLA Eligibility and, if CERCLA-Eligible, has a CERCLA-Related Release Occurred at the Site?

Historical information indicates the site is an unlined, non-permitted disposal area whose date(s) of debris disposal are unknown. Debris identified at AOC 8 during the SI includes wood, concrete, glass, plexiglass, various metal debris (wire, piping, fencing, bars, rods, chains), construction debris (bricks, burned and unburned wood, nails, burlap, plexiglass shards), a chalky, blue powder, steel cylinders, a metal container, and cable. Since buried debris has been observed at AOC 8 and because VOCs, SVOCs, pesticides, PCBs, and inorganics were detected during the SI, it is considered to be CERCLA-eligible. AOC 8 is further evaluated in the decision analysis process in Step 2a.

7.3.2 Step 2 – Does the CERCLA Release Pose Potential Unacceptable Risks to Human Health and the Environment?

Step 2a – Comparison of Data against Conservative Risk-Based Screening Values

Specifically, the data for the CERCLA-related constituents detected at AOC 8 are compared to the screening criteria described in Section 1 and exceedances of the screening criteria are identified on **Tables 7-1** through **7-3**. Those constituents that exceed one or more criteria (and background, if available, for inorganics) are shown in **Figures 7-5** through **7-7**.

In summary, one SVOC (benzo(b)fluoranthene), one pesticide (endrin aldehyde), one PCB (Aroclor-1260), and five inorganics (arsenic, chromium, selenium, thallium, and zinc) exceeded screening criteria in surface soil and one pesticide (endrin aldehyde), one PCB (Aroclor-1260), and one inorganic (arsenic) exceeded screening criteria in subsurface soil. One VOC (PCE), three total inorganics (arsenic, iron, and manganese) and six dissolved inorganics (aluminum, arsenic, cobalt, iron, thallium, and manganese) exceeded screening criteria in groundwater.

Step 2b—Conduct a Qualitative Risk Evaluation Using More Realistic Assumptions

Human Health Risk Evaluation

Exposure to surface soil at AOC 8 may result in unacceptable human health risks associated with benzo(b)fluoranthene, Aroclor-1260, arsenic, and chromium. However, based on the assumption that chromium is likely present in the trivalent, not the hexavalent, form, none of these constituents would be considered COPCs. Exposure to subsurface soil at AOC 8 is not expected to result in any unacceptable human health risks. Exposure to groundwater at AOC 8 may result in unacceptable human health risks associated with PCE and arsenic.

Ecological Risk Evaluation

At AOC 8, potential unacceptable ecological risks were identified with exposure to surface and subsurface soil attributable to endrin aldehyde. However, because of the low detected concentrations (all less than 50 µg/kg) of this constituent, the detections are likely attributable to normal pesticide use. No potential unacceptable ecological risks were identified with exposure to groundwater.

7.3.3 Step 3—Is Further Investigation or Action Required?

Results from the test pitting activities indicate that buried debris exists at AOC 8; however, since the depth of buried debris was greater than the maximum excavation depth of the equipment used during test pitting (20 feet), the vertical extent of debris was not characterized in all test pits; however, it is unlikely that buried debris exists below the groundwater table (estimated to be less than 30 feet bgs based on site-specific DPT borings and test trenches and depth to water at nearby Site 7, located near and to the north of AOC 8). The horizontal extent of the southern buried debris area was not delineated outside the bermed area. Therefore, additional test pitting is recommended to delineate the lateral extent of buried debris inside and outside the bermed area.

Exposure to surface soil at AOC 8 may result in unacceptable human health risks associated with benzo(b)fluoranthene, Aroclor-1260, arsenic, and chromium. There are no potential ecological risks associated with surface soil. Exposure to subsurface soil at AOC 8 is not expected to result in any unacceptable human health or ecological risks.

Exposure to groundwater at AOC 8 may result in unacceptable human health risks associated with PCE and arsenic. No potential unacceptable ecological risks were identified with exposure to groundwater.

An RI is recommended to characterize the nature and extent of contamination within soil and groundwater and quantify the associated risk. Monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. Since the extent of the debris was not delineated to the south, additional soil samples are recommended in this area. It is recommended soil samples are analyzed for PAHs, PCBs, and inorganics, plus analyze two surface soil samples for chromium speciation to determine its form and whether or not it is a COPC. It is recommended groundwater samples are analyzed for VOCs and inorganics (total and dissolved). **Table 7-4** summarizes the results of the decision analysis for AOC 8.

TABLE 7-1
AOC 8 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05
Sample ID					CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008
Sample Date					10/22/08	10/22/08	10/22/08	10/24/08	10/24/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name									
Volatile Organic Compounds (UG/KG)									
Acetone	--	--	63,000,000	6,100,000	3 B	**36 J**	11 U	11 U	10 U
Semivolatile Organic Compounds (UG/KG)									
Benzaldehyde	--	--	1,200,000	780,000	360 U	370 U	370 U	**180 J**	360 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	360 U	370 U	370 U	**290 J**	360 U
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	360 U	370 U	370 U	**210 J**	360 U
Chrysene	--	HMW PAH	210,000	15,000	360 U	370 U	370 U	**210 J**	360 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	360 U	370 U	370 U	**260 J**	360 U
PAH (HMW)	--	18,000	--	--	1,620 U	1,665 U	1,665 U	**1,860**	1,620 U
PAH (LMW)	--	29,000	--	--	1,620 U	1,665 U	1,665 U	**1,700**	1,620 U
Pyrene	--	HMW PAH	1,700,000	170,000	360 U	370 U	370 U	**250 J**	360 U
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDD	--	583	7,200	2,000	3.6 U	3.6 U	**0.23 J**	**2.4 J**	**0.37 J**
4,4'-DDE	--	114	5,100	1,400	3.6 U	3.6 U	**0.34 J**	**4.8 J**	**17**
4,4'-DDT	--	100	7,000	1,700	**0.44 J**	3.6 U	**1.2 J**	7.3 U	**14**
Aroclor-1260	--	8,000	740	220	36 U	36 U	38 U	**420**	36 U
Dieldrin	--	10.5	110	30	**0.29 J**	3.6 U	**0.34 J**	7.3 U	3.6 U
Endrin aldehyde	--	1.95	18,000	1,800	3.6 U	3.6 U	**0.43 J**	**21 J**	3.6 U
gamma-Chlordane	--	52.9	6,500	1,600	1.8 U	1.8 U	1.9 U	**0.81 J**	1.8 U
Heptachlor epoxide	--	11.0	190	53	1.8 U	1.8 U	1.9 U	**0.76 J**	1.8 U
Explosives (UG/KG)									
No Detections									
Total Metals (MG/KG)									
Aluminum	12,200	pH < 5.5	99,000	7,700	**7,900**	**3,870**	**6,760**	**11,600**	**9,290**
Antimony	11	78.0	41	3.1	5.2 R	5.4 R	5.4 R	**1.7 L**	5.5 R
Arsenic	6.36	18.0	1.6	0.39	**3.3 K**	**2.4 K**	**3.7 K**	**15.4 K**	**3.2 K**
Barium	52.9	330	19,000	1,500	**32.6**	**12.1 J**	**32.4**	**69.1**	**16.1 J**
Beryllium	0.587	40.0	200	16	**0.33 J**	**0.2 J**	**0.32 J**	**0.55**	**0.29 J**
Cadmium	1.5	32.0	80	7	**0.09 J**	**0.08 J**	**0.11 J**	**0.71**	**0.09 J**
Calcium	2,290	--	--	--	**1,010**	**395 J**	**930**	**6,170**	**802**
Chromium	18.2	64.0	5.6	0.29	**11**	**7.7**	**9.4**	**26.5**	**13.9**
Cobalt	9.93	13.0	30	2.3	**1.3 J**	**0.72 J**	**1.3 J**	**2.8 J**	**1.3 J**
Copper	4.25	70.0	4,100	310	**4.2**	**2 J**	**6**	**40.3**	**2.8**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**7,950**	**5,020**	**7,760**	**15,800**	**9,320**
Lead	17.4	120	800	400	**21.3**	**8.8**	**18.7**	**60.7**	**6.4**
Magnesium	1,070	--	--	--	**650**	**600**	**615**	**1,930**	**852**
Manganese	324	220	2,300	180	**59.6 L**	**23.3 L**	**59.6 L**	**170 L**	**24 L**
Mercury	0.111	0.10	31	2.3	0.09 UL	0.084 UL	0.11 UL	**0.04 L**	0.11 UL
Nickel	9.52	38.0	2,000	150	**3.7**	**1.7 J**	**3.4 J**	**8**	**3.6 J**
Potassium	708	--	--	--	**555**	**893**	**470**	**1,590**	**1,090**
Selenium	0.51	0.52	510	39	3 U	3.1 U	3.2 U	**0.6 J**	3.2 U
Sodium	521	--	--	--	**31 J**	**18.7 J**	**24.3 J**	**125 J**	**26.4 J**
Thallium	--	1.00	1[1]	.078[1]	**0.08 J**	2.5 U	2.1 U	2.2 U	**0.06 J**

TABLE 7-1
AOC 8 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05
Sample ID					CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008
Sample Date					10/22/08	10/22/08	10/22/08	10/24/08	10/24/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name									
Vanadium	27.9	130	520	39	**15.3**	**10.8**	**13**	**26.3**	**21.2**
Zinc	26.5	120	31,000	2,300	**18**	**8.5**	**31.8**	**160**	**12.3**
Wet Chemistry									
% Solids (pct)	--	--	--	--	**92**	**88**	**89**	**92**	**92**
pH (ph)	--	--	--	--	**6.3**	**5.3**	**6.6**	**7.9**	**6.9**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**21,000 K**	**12,000 K**	**9,800 K**	**45,000 K**	**12,000 K**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, Res & Ind RSLs

Bold indicates detection

[1]Adjusted June 2011 RSL value

-- - No value available

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - Analyte not detected

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

TABLE 7-1
AOC 8 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID					CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date					10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name										
Volatile Organic Compounds (UG/KG)										
Acetone	--	--	63,000,000	6,100,000	3 B	12 U	11 U	3 B	3 B	3 B
Semivolatile Organic Compounds (UG/KG)										
Benzaldehyde	--	--	1,200,000	780,000	410 U	400 U	360 U	380 U	360 U	360 U
Benzo(b)fluoranthene	--	HMW PAH	2,100	150	410 U	400 U	360 U	**270 J**	360 U	360 U
Benzo(k)fluoranthene	--	HMW PAH	21,000	1,500	410 U	400 U	360 U	**210 J**	360 U	360 U
Chrysene	--	HMW PAH	210,000	15,000	410 U	400 U	360 U	380 U	360 U	360 U
Fluoranthene	--	LMW PAH	2,200,000	230,000	410 U	400 U	360 U	380 U	360 U	360 U
PAH (HMW)	--	18,000	--	--	1,845 U	1,800 U	1,620 U	**1,810**	1,620 U	1,620 U
PAH (LMW)	--	29,000	--	--	1,845 U	1,800 U	1,620 U	**1,710**	1,620 U	1,620 U
Pyrene	--	HMW PAH	1,700,000	170,000	410 U	400 U	360 U	380 U	360 U	360 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	--	583	7,200	2,000	3.8 U	3.8 U	3.7 U	**0.92 J**	3.6 U	3.6 U
4,4'-DDE	--	114	5,100	1,400	**0.31 J**	**0.64 J**	**1.3 J**	**2 J**	3.6 U	3.6 U
4,4'-DDT	--	100	7,000	1,700	3.8 U	3.8 U	**2.3 J**	**7.1 J**	3.6 U	3.6 U
Aroclor-1260	--	8,000	740	220	**110 J**	**190**	37 U	**180**	36 U	36 U
Dieldrin	--	10.5	110	30	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
Endrin aldehyde	--	1.95	18,000	1,800	**4.2 J**	**8.2 J**	**0.33 J**	**12 J**	3.6 U	3.6 U
gamma-Chlordane	--	52.9	6,500	1,600	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Heptachlor epoxide	--	11.0	190	53	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Explosives (UG/KG)										
No Detections										
Total Metals (MG/KG)										
Aluminum	12,200	pH < 5.5	99,000	7,700	**4,260**	**8,970**	**10,300**	**9,400**	**7,810**	**8,380**
Antimony	11	78.0	41	3.1	5.1 R	4.9 R	6.4 R	**0.71 L**	5.7 UL	4.3 UL
Arsenic	6.36	18.0	1.6	0.39	**1.8 K**	**3 K**	**3.5 K**	**9.1 K**	**2.4 L**	**2.5 L**
Barium	52.9	330	19,000	1,500	**8.1 J**	**19.5**	**68.4**	**47.6**	**42.3**	**45**
Beryllium	0.587	40.0	200	16	**0.35 J**	**0.4 J**	**0.47 J**	**0.37 J**	**0.48 J**	**0.48**
Cadmium	1.5	32.0	80	7	**0.12 J**	**0.17 J**	**0.14 J**	**0.38 J**	0.03 B	0.36 U
Calcium	2,290	--	--	--	**430**	**826**	**2,860**	**1,770**	**489 J**	**545 J**
Chromium	18.2	64.0	5.6	0.29	**18.7**	**20.5**	**20.6**	**16.8**	**7.6 K**	**8.1 K**
Cobalt	9.93	13.0	30	2.3	**1.7 J**	**2 J**	**3.3 J**	**1.8 J**	**2.5 J**	**2.5 J**
Copper	4.25	70.0	4,100	310	**2.6**	**4.1**	**7.3**	**21.4**	**3.6**	**3.6**
Iron	19,900	pH < 5 or pH > 8	72,000	5,500	**6,560**	**9,690**	**12,300**	**9,000**	**4,980**	**6,330**
Lead	17.4	120	800	400	**3 J**	**9.6 J**	**10.6**	**39.4**	**17.4**	**17.6**
Magnesium	1,070	--	--	--	**664**	**1,020**	**3,180**	**920**	**538**	**570**
Manganese	324	220	2,300	180	**17.6 L**	**24.4 L**	**144 L**	**72.3 L**	**106 L**	**110 L**
Mercury	0.111	0.10	31	2.3	0.098 UL	0.13 UL	0.1 UL	0.12 UL	0.11 UL	0.11 UL
Nickel	9.52	38.0	2,000	150	**4.5**	**5.3**	**8.3**	**5.4**	**4**	**4.2**
Potassium	708	--	--	--	**705**	**1,140**	**3,200**	**778**	**367 J**	**382**
Selenium	0.51	0.52	510	39	3 U	2.9 U	3.8 U	2.8 U	3.3 U	2.5 U
Sodium	521	--	--	--	**17.8 J**	**33.5 J**	**72.6 J**	**46.4 J**	**36.2 J**	**34.8 J**
Thallium	--	1.00	1[1]	.078[1]	2.2 U	2.2 U	2.1 U	1.7 U	2.4 U	1.8 U

TABLE 7-1
AOC 8 Surface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SS**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID					CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date					10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Sample Depth					0-6"	0-6"	0-6"	0-6"	0-6"	0-6"
Chemical Name										
Vanadium	27.9	130	520	39	**19**	**27.4**	**28.9**	**17.9**	**11.8**	**12.7**
Zinc	26.5	120	31,000	2,300	**11.5**	**19**	**25.8**	**64.4**	**25.8**	**31.8**
Wet Chemistry										
% Solids (pct)	--	--	--	--	**81**	**83**	**90**	**86**	**92**	**93**
pH (ph)	--	--	--	--	**6.4**	NA	**8.1**	**7.6**	**5.8**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**3,400 K**	NA	**12,000 K**	**14,000 K**	**20,000**	NA

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, Res & Ind RSLs
Bold indicates detection
[1]Adjusted June 2011 RSL value
-- - No value available
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 7-2
AOC 8 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO01		CAA08-SO02	CAA08-SO03	CAA08-SO04	
Sample ID					CAA08-SB01-1008	CAA08-SBTP24-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SBTP14-1008	CAA08-SB04-1008
Sample Date					10/22/08	10/27/08	10/22/08	10/22/08	10/23/08	10/24/08
Sample Depth					0.5-2'	20'	0.5-2'	0.5-2'	20'	0.5-2'
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,4-Dichlorobenzene	--	--	12,000	2,400	12 U	12 U	11 U	12 U	11 U	11 U
2-Butanone	--	--	20,000,000	2,800,000	12 U	12 U	11 U	12 U	11 U	11 U
Semivolatile Organic Compounds (UG/KG)										
No Detections					NA	NA	NA	NA		
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	--	583	7,200	2,000	3.5 U	4 U	4.1 U	3.7 U	7.4 U	7.2 U
4,4'-DDE	--	114	5,100	1,400	3.5 U	4 U	4.1 U	**0.38 J**	**7.2 J**	**4.5 J**
4,4'-DDT	--	100	7,000	1,700	3.5 U	4 U	4.1 U	**0.48 J**	7.4 U	**24 J**
alpha-BHC	--	226	270	77	1.8 U	2 U	2 U	1.9 U	3.7 U	**0.81 J**
Aroclor-1260	--	8,000	740	220	35 U	**36 J**	41 U	37 U	**400**	**500 J**
Endrin	--	1.95	18,000	1,800	3.5 U	**0.48 J**	4.1 U	3.7 U	7.4 U	7.2 U
Endrin aldehyde	--	1.95	18,000	1,800	3.5 U	**2.2 J**	4.1 U	**0.36 J**	**22 J**	**24 J**
Heptachlor	--	--	380	110	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U
Heptachlor epoxide	--	52.9	190	53	1.8 U	2 U	2 U	1.9 U	3.7 U	**1.7 J**
Explosives (UG/KG)										
No Detections					NA	NA	NA	NA		
Total Metals (MG/KG)										
Aluminum	13,000	pH < 5.5	99,000	7,700	**9,820**	**3,730**	**5,410**	**9,610**	**12,500**	**7,970**
Antimony	--	78.0	41	3.1	3.9 R	**0.48 L**	4.1 R	6.9 R	4.5 R	**0.33 L**
Arsenic	5.54	18.0	1.6	0.39	**3 K**	**9.2 K**	**5 K**	**3.7 K**	**3.6 K**	**6.7 K**
Barium	84.5	330	19,000	1,500	**35.7**	**5.7 J**	**8.1 J**	**35.4**	**29.6**	**38.7**
Beryllium	0.52	40.0	200	16	**0.31 J**	**0.2 J**	**0.28 J**	**0.42 J**	**0.38 J**	**0.46 J**
Cadmium	--	32.0	80	7	**0.06 J**	**0.08 J**	0.04 B	**0.1 J**	0.02 B	**0.45 J**
Calcium	2,380	--	--	--	**590**	**451**	**389**	**730**	**943**	**4,350**
Chromium	33.7	64.0	5.6	0.29	**11.5**	**13.8**	**15.7**	**14.7**	**18.8**	**15.8**
Cobalt	5.18	13.0	30	2.3	**1.4 J**	**0.44 J**	**0.63 J**	**1.6 J**	**1.7 J**	**2.3 J**
Copper	3.17	70.0	4,100	310	**3.7**	**3.6**	**1.9**	**3.9**	**2.6**	**13.2**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**7,450**	**5,250**	**7,250**	**9,270**	**11,000**	**10,100**
Lead	8.79	120	800	400	**17.6**	**4.5**	**3.4**	**19.4**	**4.3**	**43.1**
Magnesium	1,120	--	--	--	**700**	**448**	**1,010**	**996**	**987**	**1,770**
Manganese	176	220	2,300	180	**50.7 L**	**22 L**	**13.3 L**	**65 L**	**25.6 L**	**112 L**
Mercury	0.14	0.10	31	2.3	0.1 UL	0.12 UL	0.088 UL	0.09 UL	0.1 UL	**0.04 L**
Nickel	17.6	38.0	2,000	150	**4.2**	**1.1 J**	**2 J**	**4.6**	**4.4**	**5.6**
Potassium	901	--	--	--	**609**	**605**	**1,660**	**1,040**	**949**	**1,510**
Selenium	0.64	0.52	510	39	2.3 U	**0.4 J**	2.4 U	4 U	**0.37 J**	3.6 U
Sodium	811	--	--	--	**36 J**	**15.1 J**	**21.9 J**	**29.1 J**	**56 J**	**65.3 J**
Vanadium	48.3	130	520	39	**17**	**14.8**	**18.6**	**18.8**	**28**	**21**
Zinc	28	120	31,000	2,300	**15.2**	**13.7**	**7.8**	**20.5**	**13.2**	**88.8**

TABLE 7-2
AOC 8 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO01		CAA08-SO02	CAA08-SO03	CAA08-SO04	
Sample ID					CAA08-SB01-1008	CAA08-SBTP24-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SBTP14-1008	CAA08-SB04-1008
Sample Date					10/22/08	10/27/08	10/22/08	10/22/08	10/23/08	10/24/08
Sample Depth					0.5-2'	20'	0.5-2'	0.5-2'	20'	0.5-2'
Chemical Name										
Wet Chemistry										
% Solids (pct)	--	--	--	--	**80**	**80**	**87**	**85**	**94**	**92**
pH (ph)	--	--	--	--	**6.3**	**7.4**	**5.7**	**6.6**	**7.1**	**7.3**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**12,000 K**	**560 K**	**1,000 K**	**6,500 K**	**2,900 K**	**35,000 K**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
-- - No value available
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 7-2
AOC 8 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO05		CAA08-SO06		CAA08-SO07	CAA08-SO08
Sample ID					CAA08-SB05-1008	CAA08-SBTP19-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008
Sample Date					10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08
Sample Depth					0.5-2'	20'	0.5-2'	0.5-2'	0.5-2'	0.5-2'
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,4-Dichlorobenzene	--	--	12,000	2,400	10 U	**1 J**	12 U	12 U	12 U	11 U
2-Butanone	--	--	20,000,000	2,800,000	10 U	**2 J**	**2 J**	12 U	12 U	11 U
Semivolatile Organic Compounds (UG/KG)										
No Detections										
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	--	583	7,200	2,000	**1.3 J**	390 U	4 U	4 U	**4**	3.7 U
4,4'-DDE	--	114	5,100	1,400	**6.8**	**390 J**	**0.34 J**	4 U	**7.8**	3.7 U
4,4'-DDT	--	100	7,000	1,700	**3 J**	390 U	4 U	4 U	**13**	**0.53 J**
alpha-BHC	--	226	270	77	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U
Aroclor-1260	--	8,000	740	220	35 U	**26,000 J**	40 U	40 U	37 U	37 U
Endrin	--	1.95	18,000	1,800	3.5 U	390 U	**0.5 J**	4 U	3.7 U	3.7 U
Endrin aldehyde	--	1.95	18,000	1,800	3.5 U	**1,600 J**	**1.7 J**	**0.51 J**	3.7 U	**0.72 J**
Heptachlor	--	--	380	110	1.8 U	**31 J**	2 U	2 U	1.9 U	1.8 U
Heptachlor epoxide	--	52.9	190	53	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U
Explosives (UG/KG)										
No Detections										
Total Metals (MG/KG)										
Aluminum	13,000	pH < 5.5	99,000	7,700	**5,630**	**4,020**	**4,140**	**4,890**	**8,870**	**8,230**
Antimony	--	78.0	41	3.1	4.2 R	4.8 R	5.5 R	5.1 R	5 UL	5.5 R
Arsenic	5.54	18.0	1.6	0.39	**2.7 K**	**1.4 K**	**1.5 K**	**2.4 K**	**4.4 L**	**3.5 K**
Barium	84.5	330	19,000	1,500	**14.4**	**10.5 J**	**8.5 J**	**9.2 J**	**40.5**	**30.1**
Beryllium	0.52	40.0	200	16	**0.42**	**0.38 J**	**0.36 J**	**0.37 J**	**0.32 J**	**0.32 J**
Cadmium	--	32.0	80	7	**0.44**	**0.86**	**0.1 J**	**0.12 J**	0.41 U	0.06 B
Calcium	2,380	--	--	--	**11,100**	**461**	**256 J**	**331 J**	**7,840 J**	**626**
Chromium	33.7	64.0	5.6	0.29	**14.8**	**14.3**	**15.9**	**19**	**25.8 K**	**10.9**
Cobalt	5.18	13.0	30	2.3	**1.8 J**	**1.7 J**	**1.6 J**	**2.7 J**	**2.3 J**	**1.4 J**
Copper	3.17	70.0	4,100	310	**2.3**	**6.8**	**2.2 J**	**2 J**	**6.5**	**4**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**8,160**	**4,520**	**5,890**	**6,710**	**10,100**	**7,520**
Lead	8.79	120	800	400	**4.6**	**22.3**	**2.5**	**2.7**	**11.1**	**14**
Magnesium	1,120	--	--	--	**911**	**651**	**643**	**840**	**1,720**	**700**
Manganese	176	220	2,300	180	**31 L**	**22 L**	**16 L**	**18.7 L**	**84.1 L**	**42.2 L**
Mercury	0.14	0.10	31	2.3	0.1 UL	**0.87**	0.12 UL	0.13 UL	0.1 UL	0.11 UL
Nickel	17.6	38.0	2,000	150	**5.2**	**4.7**	**5.3**	**7.1**	**9.3**	**3.5 J**
Potassium	901	--	--	--	**1,120**	**707**	**740**	**948**	**1,560**	**721**
Selenium	0.64	0.52	510	39	**0.29 J**	2.8 U	3.2 U	3 U	2.9 U	3.2 U
Sodium	811	--	--	--	**159 J**	**19.9 J**	**16.8 J**	**17.4 J**	**69 J**	**20.6 J**
Vanadium	48.3	130	520	39	**18.4**	**16.8**	**16.9**	**17.3**	**22.6**	**16.2**
Zinc	28	120	31,000	2,300	**15.1**	**28.1**	**10.6**	**15.8**	**21**	**16.4**

TABLE 7-2
AOC 8 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO05		CAA08-SO06		CAA08-SO07	CAA08-SO08
Sample ID					CAA08-SB05-1008	CAA08-SBTP19-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008
Sample Date					10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08
Sample Depth					0.5-2'	20'	0.5-2'	0.5-2'	0.5-2'	0.5-2'
Chemical Name										
Wet Chemistry										
% Solids (pct)	--	--	--	--	**95**	**86**	**84**	**82**	**86**	**90**
pH (ph)	--	--	--	--	**8.4**	**7.8**	**5.2**	NA	**8.6**	**7.4**
Total organic carbon (TOC) (ug/g)	--	--	--	--	**7,900 K**	**2,700 K**	**800 K**	NA	**7,300**	**4,500 K**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
-- - No value available
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 7-2
AOC 8 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO09	
Sample ID					CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date					10/28/08	10/28/08
Sample Depth					0.5-2'	0.5-2'
Chemical Name						
Volatile Organic Compounds (UG/KG)						
1,4-Dichlorobenzene	--	--	12,000	2,400	10 U	10 U
2-Butanone	--	--	20,000,000	2,800,000	10 U	10 U
Semivolatile Organic Compounds (UG/KG)						
No Detections						
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	--	583	7,200	2,000	3.5 U	3.5 U
4,4'-DDE	--	114	5,100	1,400	3.5 U	3.5 U
4,4'-DDT	--	100	7,000	1,700	3.5 U	3.5 U
alpha-BHC	--	226	270	77	1.8 U	1.8 U
Aroclor-1260	--	8,000	740	220	35 U	35 U
Endrin	--	1.95	18,000	1,800	3.5 U	3.5 U
Endrin aldehyde	--	1.95	18,000	1,800	3.5 U	3.5 U
Heptachlor	--	--	380	110	1.8 U	1.8 U
Heptachlor epoxide	--	52.9	190	53	1.8 U	1.8 U
Explosives (UG/KG)						
No Detections						
Total Metals (MG/KG)						
Aluminum	13,000	pH < 5.5	99,000	7,700	**7,500**	**7,480**
Antimony	--	78.0	41	3.1	3.3 UL	3.9 UL
Arsenic	5.54	18.0	1.6	0.39	**1.8 L**	**2.1 L**
Barium	84.5	330	19,000	1,500	**41.8**	**46.9**
Beryllium	0.52	40.0	200	16	**0.35**	**0.4**
Cadmium	--	32.0	80	7	0.27 U	0.33 U
Calcium	2,380	--	--	--	**331 J**	**350 J**
Chromium	33.7	64.0	5.6	0.29	**7.4 K**	**7.6 K**
Cobalt	5.18	13.0	30	2.3	**1.8 J**	**2.1 J**
Copper	3.17	70.0	4,100	310	**1.6**	**1.6**
Iron	32,000	pH < 5 or pH > 8	72,000	5,500	**4,380**	**4,700**
Lead	8.79	120	800	400	**6.2**	**6.9**
Magnesium	1,120	--	--	--	**510**	**508**
Manganese	176	220	2,300	180	**59 L**	**72.5 L**
Mercury	0.14	0.10	31	2.3	0.1 UL	0.11 UL
Nickel	17.6	38.0	2,000	150	**3.3**	**3.5**
Potassium	901	--	--	--	**341**	**314 J**
Selenium	0.64	0.52	510	39	1.9 U	2.3 U
Sodium	811	--	--	--	**31 J**	**25.8 J**
Vanadium	48.3	130	520	39	**10.7**	**10.7**
Zinc	28	120	31,000	2,300	**10.6**	**11.2**

TABLE 7-2
AOC 8 Subsurface Soil Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	**CLEAN CAX BKG SB**	**Eco Surface Soil Screening Value**	**CLEAN RSLs Industrial Soil Adjusted (Nov. 2010)**	**CLEAN RSLs Residential Soil Adjusted (Nov. 2010)**	CAA08-SO09	
Sample ID					CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date					10/28/08	10/28/08
Sample Depth					0.5-2'	0.5-2'
Chemical Name						
Wet Chemistry						
% Solids (pct)	--	--	--	--	**94**	**95**
pH (ph)	--	--	--	--	**5.7**	NA
Total organic carbon (TOC) (ug/g)	--	--	--	--	**8,100**	NA

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Res RSL
Exceeds BKG, Res & Ind RSLs
Exceeds BKG, ECO, Res & Ind RSLs
Bold indicates detection
-- - No value available
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - Analyte not detected
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

TABLE 7-3
AOC 8 Groundwater Detection and Exceedance Results
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Station ID	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Marine	CLEAN MCL-Groundwater (Nov. 2010)	CLEAN RSLs Tapwater Adjusted (Nov. 2010)	CAA08-DW01	CAA08-DW02	CAA08-DW03	CAA08-DW04	
Sample ID					CAA08-DW01-1008	CAA08-DW02-1008	CAA08-DW03-1008	CAA08-DW04-1008	CAA08-DW04P-1008
Sample Date					10/28/08	10/28/08	10/27/08	10/27/08	10/27/08
Chemical Name									
Volatile Organic Compounds (UG/L)									
Tetrachloroethene	--	45.0	5	0.11	10 U	**7 J**	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/L)									
No Detections									
Pesticide/Polychlorinated Biphenyls (UG/L)									
No Detections									
Explosives (UG/L)									
No Detections									
Total Metals (UG/L)									
Aluminum	2,230	87.0	--	3,700	1,050 B	**1,900**	127 B	**841**	**470**
Arsenic	2.28	36.0	10	0.045	5.6 B	10.1 B	4.3 B	**14.6**	13.9 B
Barium	118	200	2,000	730	**15.2 J**	**20.6 J**	**12.7 J**	**16.7 J**	**15.8 J**
Beryllium	2.45	100	4	7.3	5 U	**0.18 J**	5 U	5 U	5 U
Cadmium	0.605	8.85	5	1.8	0.19 B	**1.1 J**	0.52 B	**0.85 J**	0.67 B
Calcium	169,000	--	--	--	**99,300**	**76,800**	**83,800**	**96,700**	**92,800**
Cobalt	20.6	23.0	--	1.1	**4.4 J**	3 B	**1.1 J**	**5.8 J**	**5.4 J**
Iron	894	1,000	--	2,600	1,700 B	3,270 B	433 B	**8,300**	**7,400**
Lead	21.3	8.52	15	--	10 U	3.1 B	**1.2 J**	**1.1 J**	10 U
Magnesium	11,500	--	--	--	**2,540 J**	**1,750 J**	**2,310 J**	**3,720 J**	**3,590 J**
Manganese	57.9	100	--	88	**55.8**	**60.4**	**20.7**	**246**	**238**
Potassium	12,700	--	--	--	**1,220 J**	**1,510 J**	**548 L**	**3,410 J**	**3,210 J**
Selenium	--	71.1	50	18	**1.4 J**	35 U	35 U	35 U	35 U
Sodium	64,500	--	--	--	**4,270 J**	**6,950**	**7,680**	**16,200**	**15,600**
Vanadium	26.2	50.0	--	18	3.6 B	**8.2 J**	0.62 B	3.4 B	2 B
Dissolved Metals (UG/L)									
Aluminum, Dissolved	100	87.0	--	3,700	**122 J**	**135 J**	114 B	**140 J**	**125 J**
Arsenic, Dissolved	1.37	36.0	10	0.045	4.5 B	4.4 B	4.6 B	**13.8**	12.4 B
Barium, Dissolved	127	200	2,000	730	**12.2 J**	**13.5 J**	**13.3 J**	**14.8 J**	**14.7 J**
Calcium, Dissolved	113,000	--	--	--	**99,500**	**76,400**	**84,100**	**92,300**	**91,700**
Chromium, Dissolved	6.04	50.0	100	0.043	**0.76 J**	10 U	**0.51 J**	10 U	**0.41 J**
Cobalt, Dissolved	0.7	23.0	--	1.1	**1.5 J**	**1.5 J**	**0.82 J**	**5.2 J**	**5.2 J**
Copper, Dissolved	3	3.10	1,300	150	1.7 B	0.91 B	25 U	**1.4 J**	25 U
Iron, Dissolved	275	1,000	--	2,600	49.3 B	**208**	**295**	**6,650**	**6,720**
Magnesium, Dissolved	11,200	--	--	--	**2,370 J**	**1,280 J**	**2,280 J**	**3,520 J**	**3,550 J**
Manganese, Dissolved	49.5	100	--	88	**16.4**	**32.4**	**17.7**	**240**	**237**
Nickel, Dissolved	12.2	8.20	--	73	2.7 B	**5.5 J**	**3.6 J**	3 B	**3.2 J**
Potassium, Dissolved	12,600	--	--	--	**852 L**	**932 L**	**584 L**	**3,130 J**	**3,140 J**
Sodium, Dissolved	62,800	--	--	--	**4,280 J**	**6,820**	**7,690**	**15,900**	**15,700**
Thallium, Dissolved	--	21.3	2	0.037[1]	25 U	1.6 B	25 U	**1.9 J**	25 U
Vanadium, Dissolved	4.3	50.0	--	18	50 U	**0.64 J**	**0.54 J**	**0.54 J**	**0.43 J**

Notes:

Exceeds Background
Exceeds BKG & ECO
Exceeds BKG & Tapwater RSL
Exceeds BKG, Tapwater RSL & MCL
Exceeds BKG, ECO & Tapwater RSL
Bold indicates detection
[1]Adjusted June 2011 RSL
-- - No value available
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
U - Analyte not detected
UG/L - Micrograms per liter

TABLE 7-4
AOC 8 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1: Site Potentially CERCLA-eligible?	Step 1: Inorganics Above Background or Non-inorganics Detected?	Step 1: Potentially Attributable to CERCLA Release?	Step 2a: Exceedances of Comparison Criteria?	Step 2b: Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3: Is Further Investigation or Action Required?
AOC 8 Surface Soil	Yes	VOCs	Yes	No; however, 1 VOC (acetone) was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	Yes - an RI is recommended to characterize the nature and extent of contamination within soil and groundwater and quantify the associated risk. Monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for PAHs, PCBs, and inorganics, plus analyze two surface soil samples for chromium speciation to determine its form and whether or not it is a COPC. It is recommended groundwater samples are analyzed for VOCs and inorganics (total and dissolved). Additional test pitting is recommended to delineate the lateral extent of buried debris inside and outside the bermed area. Since the extent of the debris was not delineated to the south, additional soil samples are recommended in this area.
		SVOCs	Yes	Yes - 1 SVOC (benzo(b)fluoranthene - potential HH risk only). Also, benzaldehyde was identified as an initial eco COPC since no screening value was available	No, based on HH and eco risk screenings	
		Pesticides	Yes	Yes - 1 pesticide (endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 5 inorganics (As, Cr, Th -potential HH risk; Se, Zn - potential eco risk)	No, based on HH and eco risk screenings	
AOC 8 Subsurface Soil	Yes	VOCs	Yes	No; however, 1 VOC (2-butanone) was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	Yes	Yes - 1 pesticide (endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 1 inorganic (As - potential HH risk only)	No, based on HH risk screening	
AOC 8 Groundwater	Yes	VOCs	Yes	Yes - 1 VOC (tetrachloroethene (PCE) - potential HH risk only)	Yes - 1 VOC (tetrachloroethene (PCE) - potential HH risk only)	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 3 total inorganics (As - potential HH risk; Fe, Mn - potential HH and eco risks) and 6 dissolved inorganics (As, Co, Th - HH qualitative review only[1]; Fe, Mn - HH qualitative review[1] and potential eco risk ; Al - potential eco risk)	Yes - 1 inorganic (As - potential HH risk only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

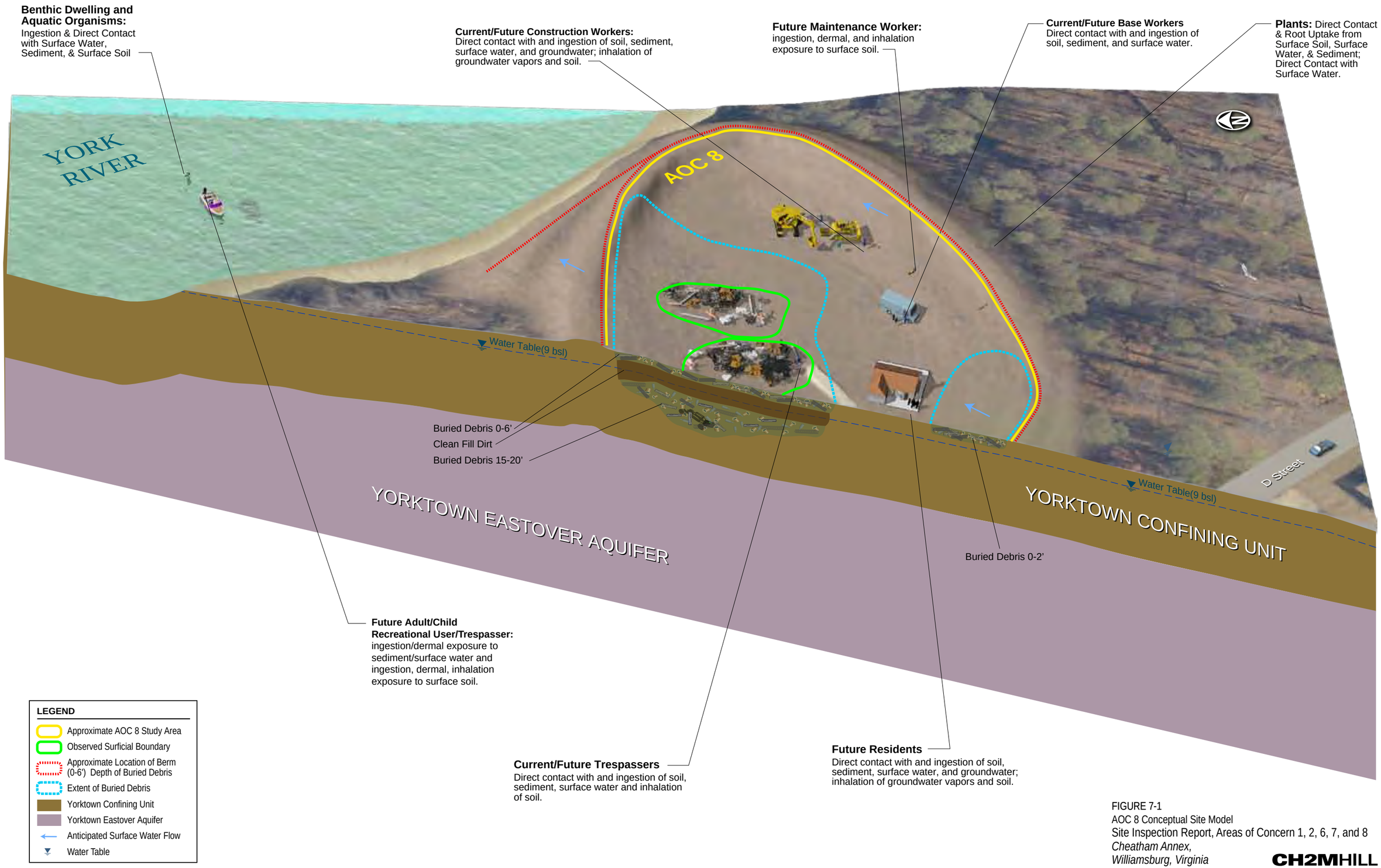

FIGURE 7-1
AOC 8 Conceptual Site Model
Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex,
Williamsburg, Virginia

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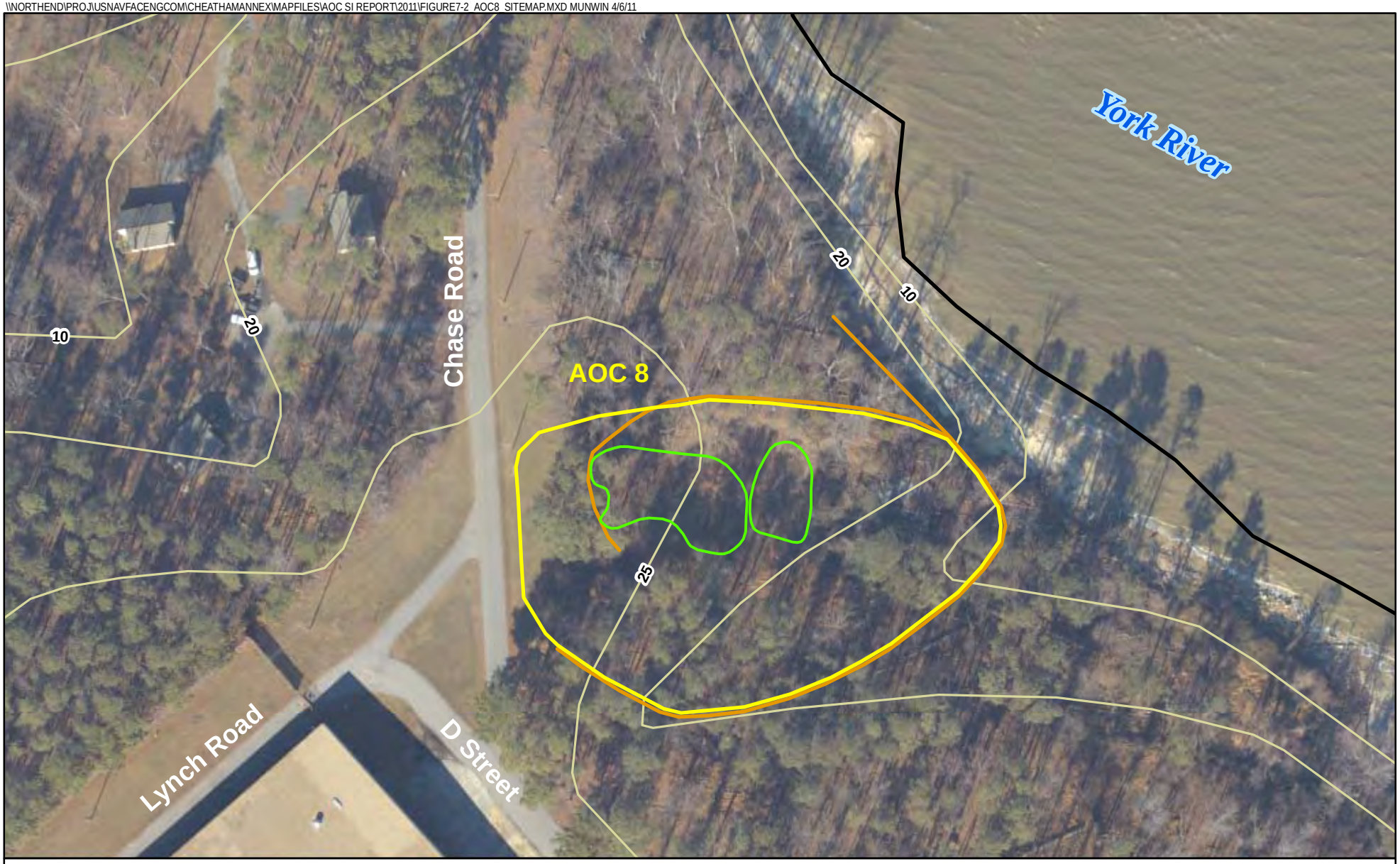
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE7-2_AOC8_SITEMAP.MXD MUNWIN 4/6/11



Legend

- Approximate AOC 8 Study Area
- CAX Boundary
- Observed Surficial Debris
- Topographic Surface Contour (feet above mean sea level)
- Approximate Location of Berm

N
W E
S

0 50 100
Feet

Figure 7-2
AOC 8 Site Map
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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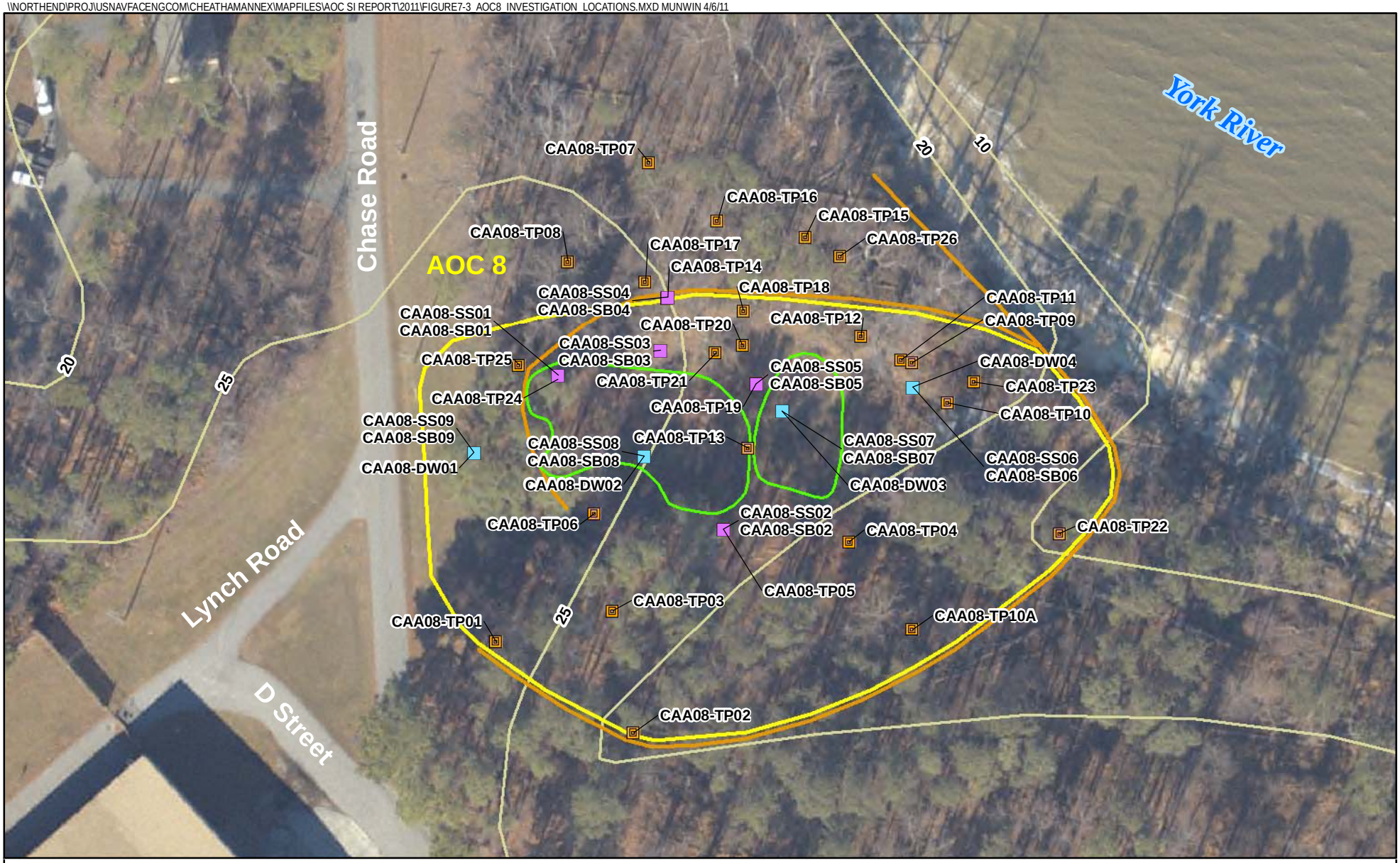
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE7-3_AOC8_INVESTIGATION_LOCATIONS.MXD MUNWIN 4/6/11



Legend

- Groundwater/Soil Sample Location
- Soil Sample Location
- Test Pits
- Approximate AOC 8 Study Area
- Observed Surficial Debris
- Topographic Surface Contour (feet above mean sea level)
- Approximate Location of Berm

N
W E
S

0 35 70
Feet

Figure 7-3
AOC 8 Comprehensive Investigation Locations
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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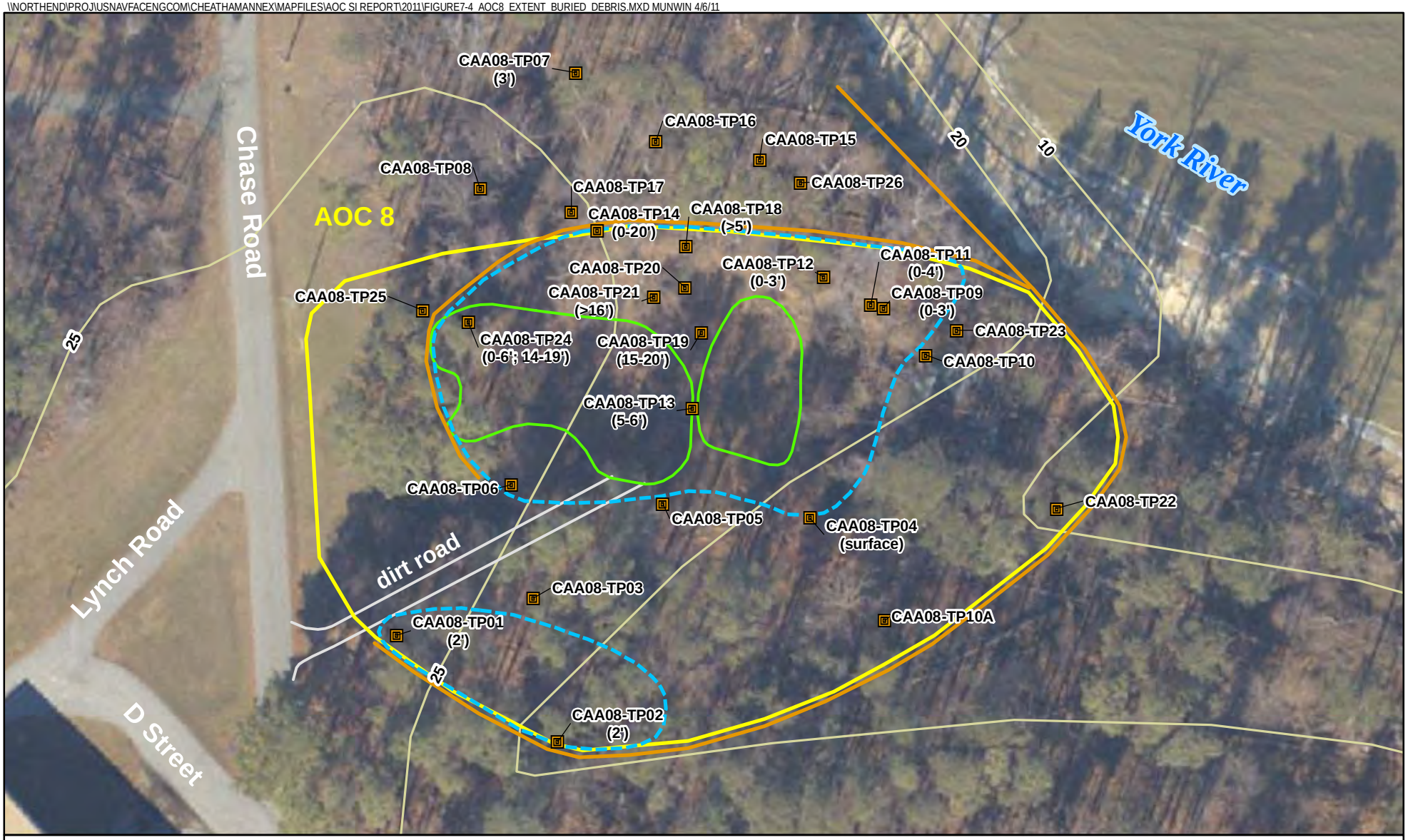
\\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE7-4_AOC8_EXTENT_BURIED_DEBRIS.MXD MUNWIN 4/6/11



Legend

- Test Pits
- Approximate AOC 8 Study Area
- Observed Surficial Debris
- Extent of Buried Debris
- Topographic Surface Contour (feet above mean sea level)
- Approximate Location of Berm
- (0-6') Depth of Buried Debris

N
W E
S

0 30 60
Feet

Figure 7-4
AOC 8 Extent of Buried Debris
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE7-5_AOC8_SS_RESULTS.MXD MUNWIN 6/22/2011 4:37:17 PM

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
SVOCs (UG/KG)				
Benzo(b)fluoranthene	--	HMW PAH	2,100	150
PAH (HMW)	--	18,000	--	--
Pesticide/PCBs (UG/KG)				
Aroclor-1260	--	8,000	740	220
Endrin aldehyde	--	1.95	18,000	1,800
Total Metals (MG/KG)				
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Selenium	0.51	0.52	510	39
Zinc	26.5	120	31,000	2,300

Station ID	CAA08-SO04
Sample ID	CAA08-SS04-1008
Sample Date	10/24/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(b)fluoranthene	290 J
Pesticide/PCBs (UG/KG)	
Aroclor-1260	420
Endrin aldehyde	21 J
Total Metals (MG/KG)	
Arsenic	15.4 K
Chromium	26.5
Selenium	0.6 J
Zinc	160

Station ID	CAA08-SO08
Sample ID	CAA08-SS08-1008
Sample Date	10/28/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(b)fluoranthene	270 J
Pesticide/PCBs (UG/KG)	
Endrin aldehyde	12 J
Total Metals (MG/KG)	
Arsenic	9.1 K

Station ID	CAA08-SO05
Sample ID	CAA08-SS05-1008
Sample Date	10/24/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO06
Sample ID	CAA08-SS06-1008*
Sample Date	10/27/08
Depth	0-6"
Pesticide/PCBs (UG/KG)	
Endrin aldehyde	8.2 J
Total Metals (MG/KG)	
Chromium	20.5

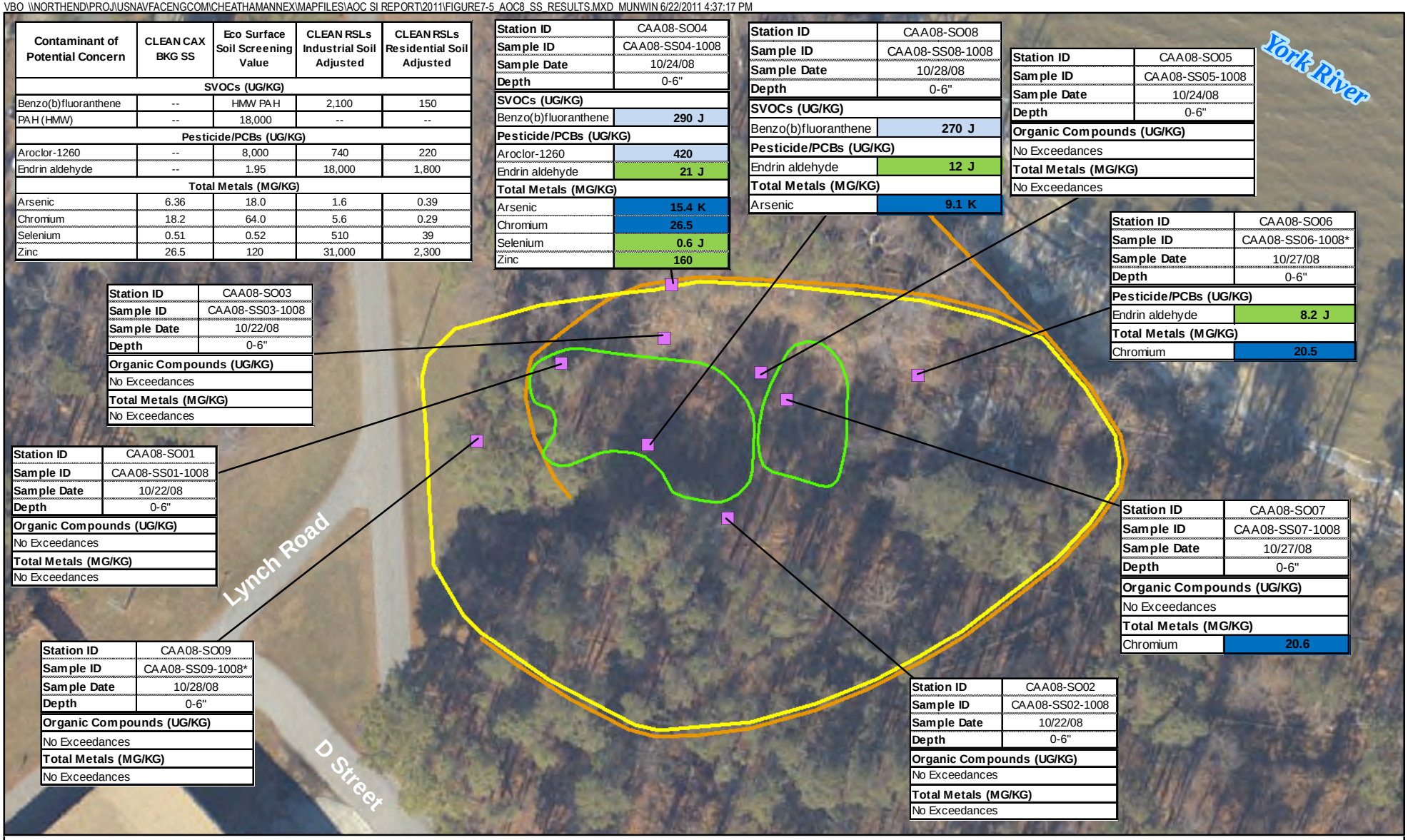
Station ID	CAA08-SO03
Sample ID	CAA08-SS03-1008
Sample Date	10/22/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO01
Sample ID	CAA08-SS01-1008
Sample Date	10/22/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO07
Sample ID	CAA08-SS07-1008
Sample Date	10/27/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Chromium	20.6

Station ID	CAA08-SO09
Sample ID	CAA08-SS09-1008*
Sample Date	10/28/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO02
Sample ID	CAA08-SS02-1008
Sample Date	10/22/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	



Legend

- Soil Sample Location
- Approximate AOC 8 Study Area
- Observed Surficial Debris
- Approximate Location of Berm

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, Res & Ind RSL

* Indicates duplicate sample was collected at this location.
Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
MG/KG - Milligrams per kilogram
UG/KG - Micrograms per kilogram

N
W E
S

0 35 70
Feet

Figure 7-5
AOC 8 Surface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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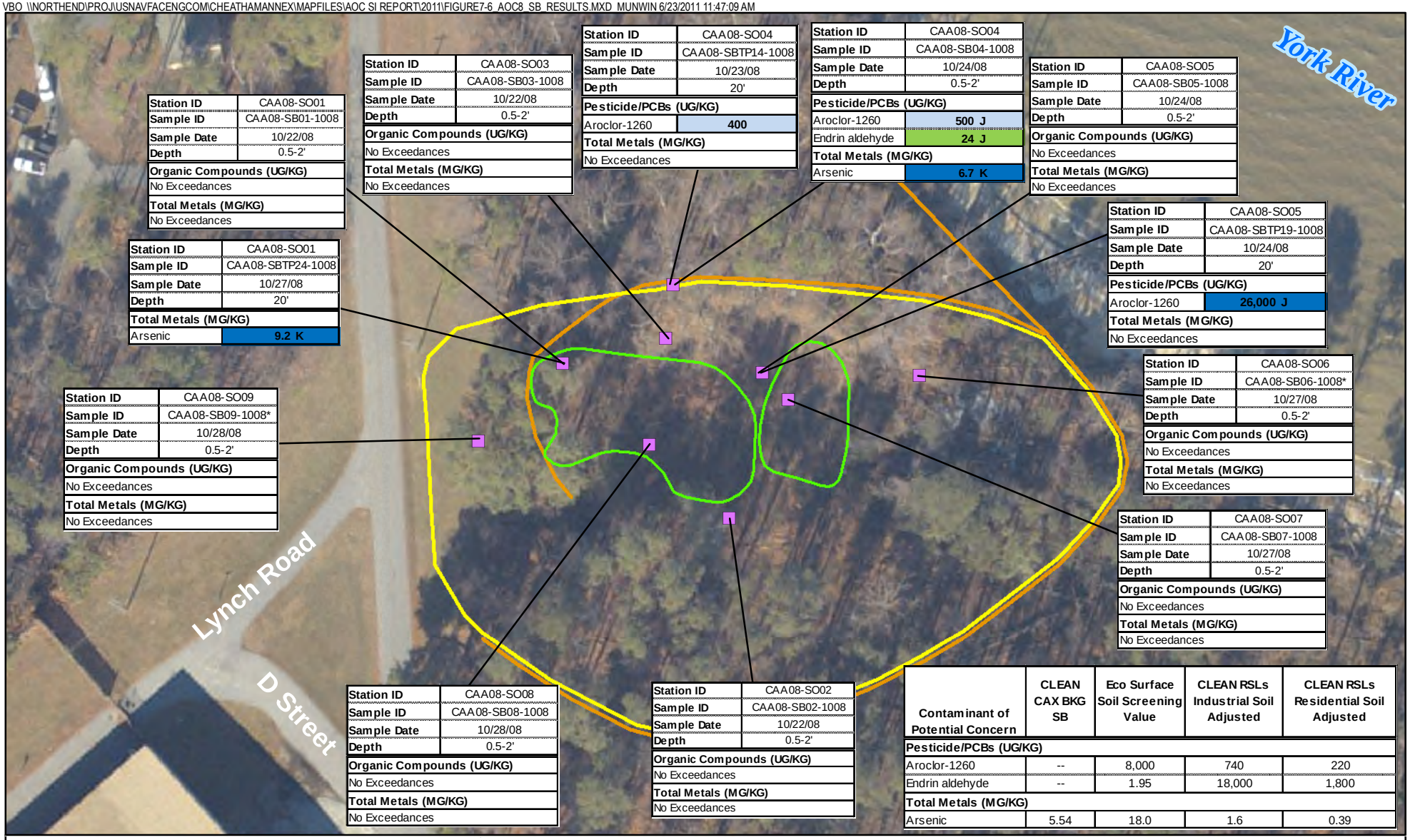


Station ID	CAA08-SO01
Sample ID	CAA08-SB01-1008
Sample Date	10/22/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO01
Sample ID	CAA08-SBTP24-1008
Sample Date	10/27/08
Depth	20'
Total Metals (MG/KG)	
Arsenic	9.2 K

Station ID	CAA08-SO03
Sample ID	CAA08-SB03-1008
Sample Date	10/22/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO04
Sample ID	CAA08-SBTP14-1008
Sample Date	10/23/08
Depth	20'
Pesticide/PCBs (UG/KG)	
Aroclor-1260	400
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO04
Sample ID	CAA08-SB04-1008
Sample Date	10/24/08
Depth	0.5-2'
Pesticide/PCBs (UG/KG)	
Aroclor-1260	500 J
Endrin aldehyde	24 J
Total Metals (MG/KG)	
Arsenic	6.7 K

Station ID	CAA08-SO05
Sample ID	CAA08-SB05-1008
Sample Date	10/24/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO05
Sample ID	CAA08-SBTP19-1008
Sample Date	10/24/08
Depth	20'
Pesticide/PCBs (UG/KG)	
Aroclor-1260	26,000 J
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO06
Sample ID	CAA08-SB06-1008*
Sample Date	10/27/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO07
Sample ID	CAA08-SB07-1008
Sample Date	10/27/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO09
Sample ID	CAA08-SB09-1008*
Sample Date	10/28/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO08
Sample ID	CAA08-SB08-1008
Sample Date	10/28/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA08-SO02
Sample ID	CAA08-SB02-1008
Sample Date	10/22/08
Depth	0.5-2'
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Pesticide/PCBs (UG/KG)				
Aroclor-1260	--	8,000	740	220
Endrin aldehyde	--	1.95	18,000	1,800
Total Metals (MG/KG)				
Arsenic	5.54	18.0	1.6	0.39

Legend

- Soil Sample Location
- Approximate AOC 8 Study Area
- Observed Surficial Debris
- Approximate Location of Berm

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, Res & Ind RSL

Samples collected at a depth greater than 2 feet below ground surface were not included in the ecological risk screening.
* Indicates duplicate sample was collected at this location.
Values presented are the higher of the two.
-- - No value available
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
MG/KG - Milligrams per kilogram
UG/KG - Micrograms per kilogram

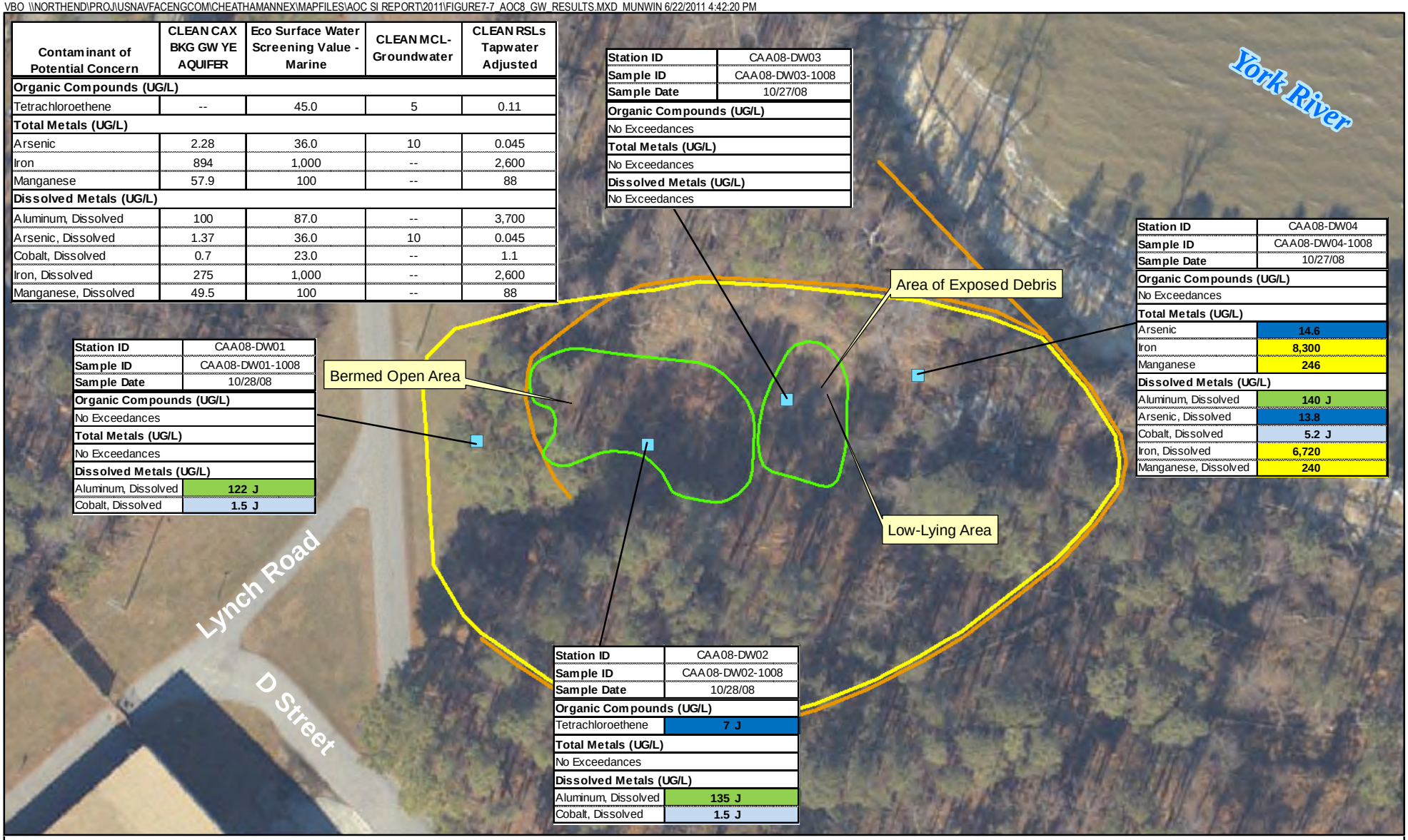
N W E S

0 35 70 Feet

Figure 7-6
AOC 8 Subsurface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\AOC SI REPORT\2011\FIGURE7-7_AOC8_GW_RESULTS.MXD MUNWIN 6/22/2011 4:42:20 PM



Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Marine	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted
Organic Compounds (UG/L)				
Tetrachloroethene	--	45.0	5	0.11
Total Metals (UG/L)				
Arsenic	2.28	36.0	10	0.045
Iron	894	1,000	--	2,600
Manganese	57.9	100	--	88
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Arsenic, Dissolved	1.37	36.0	10	0.045
Cobalt, Dissolved	0.7	23.0	--	1.1
Iron, Dissolved	275	1,000	--	2,600
Manganese, Dissolved	49.5	100	--	88

Station ID	CAA08-DW03
Sample ID	CAA08-DW03-1008
Sample Date	10/27/08
Organic Compounds (UG/L)	
No Exceedances	
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
No Exceedances	

Station ID	CAA08-DW04
Sample ID	CAA08-DW04-1008
Sample Date	10/27/08
Organic Compounds (UG/L)	
No Exceedances	
Total Metals (UG/L)	
Arsenic	14.6
Iron	8,300
Manganese	246
Dissolved Metals (UG/L)	
Aluminum, Dissolved	140 J
Arsenic, Dissolved	13.8
Cobalt, Dissolved	5.2 J
Iron, Dissolved	6,720
Manganese, Dissolved	240

Station ID	CAA08-DW01
Sample ID	CAA08-DW01-1008
Sample Date	10/28/08
Organic Compounds (UG/L)	
No Exceedances	
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
Aluminum, Dissolved	122 J
Cobalt, Dissolved	1.5 J

Station ID	CAA08-DW02
Sample ID	CAA08-DW02-1008
Sample Date	10/28/08
Organic Compounds (UG/L)	
Tetrachloroethene	7 J
Total Metals (UG/L)	
No Exceedances	
Dissolved Metals (UG/L)	
Aluminum, Dissolved	135 J
Cobalt, Dissolved	1.5 J

Legend

- Groundwater/Soil Sample Location
- Approximate AOC 8 Study Area
- Observed Surficial Debris
- Approximate Location of Berm

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Tapwater RSL
- Exceeds BKG, Tapwater RSL & MCL
- Exceeds BKG, ECO & Tapwater RSL

-- - No value available
J - Analyte present, value may or may not be accurate or precise
UG/L - Micrograms per liter

N W E S

0 35 70 Feet

Figure 7-7
AOC 8 Groundwater Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

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SECTION 8

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Appendix A
Human Health Risk Screening

APPENDIX A

Human Health Risk Screening (AOCs 1, 2, 6, 7, and 8)

A conservative human health risk screening (HHRS) was performed to determine the potential for human health risks associated with exposure to site media (surface soil, subsurface soil, groundwater, surface water, and sediment,) at AOCs 1, 2, 6, 7, and 8. The results of the human health risk screening provide a preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) identified for each AOC, and are used to help determine whether the sites require further evaluation (e.g., a baseline risk assessment or additional data collection) or future unrestricted (i.e. residential) use of the site is acceptable based on human health risks.

A.1 Human Health Conceptual Site Model

The human health conceptual site model (CSM) presents an overview of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. The human health CSM for soil, groundwater, surface water, and sediment for the AOCs is presented in Figure A-1. Section 1.3 of the SI report presents the site background for each AOC, and Section 1.3.2 of the SI report presents a brief overview of the land use at CAX.

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 (RV) sites, camp sites, an 18-hole golf course, swimming pool, ball fields, freshwater and saltwater fishing, boating, wildlife watching and hunting (DON, 1998). Access to AOC 1 is unrestricted for Navy personnel who use Jones Mill Pond for recreation and fishing, and hunt at the site; however, it restricted to the general public, as a locked chain link fence surrounds the AOC. Land use at AOC 1 is not expected to change and will likely continue as recreational for the foreseeable future. AOC 2 is currently located in a wooded area with no designated use. Future land use at AOC 2 is not expected to change and will likely continue as un-zoned use for the foreseeable future. Four of the five AOC 6 subareas are located in wooded areas currently used for recreational activities (e.g., nearby tree stands for hunting, fishing at Penniman Lake); however, there are no hiking trails or cabins in this area. AOC 6's fifth subarea, the 1918 Drum Storage Area, currently includes mowed, grassy areas, a paved parking lot, and two office buildings. Land use at AOC 6 is not expected to change and will likely continue as recreational for the subareas within the woods and industrial for the 1918 Drum Storage Area for the foreseeable future. AOC 7 is currently used for recreational activities and is the location of a popular hiking trail. Land use at AOC 7 is not expected to change and will likely continue as recreational for the foreseeable future. AOC 8 is currently a heavily vegetated area with no designated use. Future land use at AOC 8 is not expected to change and will likely continue as un-zoned use for the foreseeable future.

Potential current receptors at AOCs 1, 2, 6, 7, and 8 include recreational users/visitors, trespassers, and maintenance workers (however, recreational uses/visitors may not be applicable for all of the AOCs, such as AOC 2 and AOC 8, as discussed based on AOC use above). At AOC 6, potential current receptors also include industrial workers at the 1918 Drum Storage Area; workers from nearby buildings may frequent the area. The potential current receptors may come in contact with surface soil; exposure routes may include incidental ingestion of and dermal contact with the surface soil, and inhalation of volatile and particulate emissions from the surface soil. At AOC 6, the current recreational users/visitors and trespassers may also come in contact with the surface water and sediment at the site. Exposure routes for surface water and sediment may include incidental ingestion and dermal contact. No volatile organic compounds (VOCs) were detected in the surface water and sediment; therefore, the inhalation pathway for these two media is not considered a significant contribution to potential risks and was not further evaluated.

Potential future receptors include the current receptors, and future residents and construction workers. Future receptors could be exposed to subsurface soil if future recreational facilities, or piping/utilities, or residential houses are constructed at the site. In the risk evaluation, subsurface soil is evaluated as soil from 0.5 – 10 ft below

ground surface, which is the depth assumed to be potentially exposed during construction activities. Exposure routes for future exposure to the subsurface soil are the same as those for current surface soil, incidental ingestion of and dermal contact with the soil, and inhalation of volatile and particulate emissions from the soil.

Potable water supplies for CAX are provided by the City of Newport News Water Works. Groundwater is not used as a source of water on the base. However, a potable use scenario was evaluated in this risk assessment. It was conservatively assumed if future residential development of the site occurs; the residents could use the groundwater as a potable water supply. The residents would be exposed through ingestion, and dermal contact and inhalation while bathing. Additionally, due to the depth to groundwater (less than10 feet below ground surface in a number of monitoring wells) at the AOCs, construction workers could be exposed to the groundwater through dermal contact and inhalation of vapors in an excavation during construction activities.

The only AOC with a building is AOC 6 (1918 Drum Storage subarea), however, no VOCs were detected at AOC 6. There are no buildings at any of the other AOCs, and there is no future planned construction of any industrial or residential structures. Therefore, vapor intrusion from groundwater to indoor air is not considered a current or likely future exposure pathway and was not evaluated in the screening human health risk evaluation.

A.2 Human Health Risk Screening Methodology

The human health risk screening was conducted in three steps using a risk ratio technique (U.S. Navy, 2000). If COPCs were identified after Step 1, the COPCs were evaluated in Step 2. If COPCs were identified after Step 2, the COPCs were evaluated in Step 3. The risk screening evaluation for AOCs 1, 2, 6, 7, and 8 are presented in the Table 2 series in Attachment A.1 through A.5, respectively. The three-step screening process is described below:

A.2.1 Step 1

The maximum detected constituent concentrations for surface soil, subsurface soil, and groundwater were compared to the 95% upper tolerance limit (UTL) background concentrations. Concentrations of naturally occurring constituents (metals) were compared to accepted background UTLs. If the constituent concentration was below background, it was eliminated from further evaluation. As documented in Section 1.1.1 of the SI report, in March 2010, the USEPA and VDEQ consented to the use of the preliminary background values for soil and groundwater for this Draft SI Report. Partnering team agreement on the final background values is expected prior to preparation of the Draft Final SI Report, and the preliminary values (and associated text) will be revised as necessary.

There are no background data for surface water and sediment, and therefore a comparison to background levels was not performed for these two media. If there were no background data or the constituent concentration was greater than background concentration, it was then compared to the USEPA human health regional screening levels (RSL, USEPA 2010, USEPA 2011), and other human health risk screening levels (if appropriate). RSLs based on noncarcinogenic effects were adjusted by dividing by 10 to account for exposure to multiple constituents (i.e., were adjusted to a hazard quotient of 0.1, from the hazard quotient of 1.0 used on the USEPA RSL table). RSLs based on carcinogenic endpoints were used as presented in the RSL table, and are based on a carcinogenic risk of 1×10^{-6}.

The surface soil, subsurface soil, and sediment data were compared to residential and industrial soil RSLs. Although recreational users and maintenance workers are the most likely receptors at the AOCs, construction workers and industrial workers are potential receptors, in addition to residential receptors at all of the AOCs. Residential soil RSLs are more conservative (i.e., lower) than industrial soil RSLs, and are therefore protective of all potential receptors (e.g., recreational users, visitors, trespassers, residents, industrial workers, and construction workers). Therefore, if the maximum detected concentration was less than the industrial RSL but greater than the residential soil RSL, the constituent was carried forward to Step 2.

The groundwater and surface water data were compared to tap water RSLs and maximum contaminant levels (MCLs) (USEPA, 2009a). An exceedance of either, or both criteria, was used to identify the groundwater and surface water COPCs which were then carried forward to Step 2. Although filtered and unfiltered groundwater

samples were collected, only unfiltered samples were analyzed in the risk screening evaluation; analytical data from the filtered groundwater samples were reviewed for qualitative purposes only.

If the maximum detected concentration of an analyte in surface soil, subsurface soil, groundwater, surface water, or sediment exceeded the background concentration, if available, and the appropriate screening value (e.g., RSL, MCL), the analyte was identified as a COPC and the screening level risk evaluation proceeded to Step 2.

Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC for the AOC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009a). If the lead concentrations are greater than the action level, it is retained as a COPC for the AOC.

A.2.2 Step 2

For constituents identified as COPCs in Step 1, a corresponding risk level was calculated using the following equation:

$$\text{corresponding risk level} = \frac{\text{concentration x acceptable risk level}}{\text{RSL}}$$

The concentration is the maximum detected concentration (the same concentration that was used in Step 1). The acceptable risk level is 1 for noncarcinogens and 10^{-6} for carcinogens. RSLs for noncarcinogenic effects are not adjusted by 10 as was done in Step 1; they are used as presented in the RSL table. All of the corresponding risk levels for each constituent within a media are summed to calculate the cumulative corresponding hazard index (for noncarcinogens) and cumulative corresponding carcinogenic risk (for carcinogens). A cumulative corresponding hazard index is also calculated for each target organ/effect. If the cumulative corresponding hazard index for a target organ/effect is greater than the risk-ratio screening benchmark of 0.5, or the cumulative corresponding carcinogenic risk is greater than the 5×10^{-5} risk-ratio screening benchmark, the chemicals contributing to these values are retained as COPCs and carried forward to Step 3.

A.2.3 Step 3

A corresponding risk level was calculated as discussed above for Step 2. However, the 95 percent upper confidence limit (UCL) was used in place of the maximum detected concentration, to obtain a more site-specific risk ratio. If the cumulative corresponding HI by target organ/effect is greater than the risk-ratio screening benchmark of 0.5, or the cumulative corresponding carcinogenic risk is greater than the 5×10^{-5} risk-ratio screening benchmark, then chemicals contributing to these values are considered COPCs.

Step 3 was only performed for media with COPCs from Step 2 and five or more samples. Five or more samples are needed to perform the statistical calculations necessary to estimate the Step 3 exposure concentration. The most current version of the ProUCL software program (USEPA, 2009a) was used to test the data distribution and calculate 95 percent UCL exposure point concentrations (EPC) used for the Step 3 risk ratio calculations. In cases where the recommended UCL exceeded the maximum detected concentration, the maximum concentration was used as the EPC. Step 3 of the risk screening evaluation was not performed for groundwater because less than five groundwater samples were available for each AOC and a 95% UCL could not be calculated.

A.3 Human Health Risk Screening Results

The human health risk-based screening and risk ratio evaluation were performed for surface soil, subsurface soil, and groundwater for all AOCs, and surface water and sediment for AOC 6.

A.3.1 AOC 1
Risk Screening Results

The risk-based screening evaluation for surface soil, subsurface soil and groundwater at AOC 1 was conducted for two areas: AOC 1 North and AOC 1 South. The results of the risk evaluation for AOC 1 are presented in Tables 2.1 through 2.6a, Attachment A.1.

Surface Soil

AOC 1 North

Tables 2.1 through 2.1b in Attachment A.1**,** present the risk-based screening evaluation for surface soil at AOC 1 North. Five PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene] and five metals (aluminum, arsenic, chromium, manganese, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), the five PAHs and two metals (arsenic and chromium) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), the five PAHs and both metals (arsenic and chromium) were retained as COPCs for surface soil at AOC 1 North. The majority of PAHs were detected in only 3 of 11 samples (CAA01-SS04-1108, CAA01-SS05-1108, CAA01-SS11-1108), with the highest concentrations detected in sample CAA01-SS11-1108. The highest metal concentrations were detected in samples CAA01-SS04-1108 and CAA01-SS11-1108.

AOC 1 South

Tables 2.2 through 2.2b in Attachment A.1**,** present the risk-based screening evaluation for surface soil at AOC 1 South. Five PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene] and six metals (aluminum, arsenic, chromium, iron, lead, and manganese) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), the five PAHs and three metals (arsenic, chromium, and iron) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), the five PAHs and two metals (arsenic and chromium) were retained as COPCs for surface soil at AOC 1 South. PAHs were detected in only 1 of 8 samples (i.e., CAA01-SS15-1108).

The average lead concentration in the AOC 1 South surface soil is 162 mg/kg, which is less than the lead screening level. Therefore, lead is not considered to be present at a concentration of potential concern, and lead was eliminated as a COPC in AOC 1 South surface soil.

Subsurface Soil

AOC 1 North

Tables 2.3 through 2.3a in Attachment A.1**,** present the risk-based screening evaluation for subsurface soil at AOC 1 North. Three metals (aluminum, arsenic, and cobalt) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations) no COPCs were retained. Therefore, exposure to subsurface soil at AOC 1 North would not be expected to result in any unacceptable human health risks based on potential human exposure.

AOC 1 South

Tables 2.4 through 2.4b in Attachment A.1**,** present the risk-based screening evaluation for subsurface soil at AOC 1 South. Three PAHs [benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene] and seven metals (aluminum, antimony, arsenic, cobalt, iron, lead, and manganese) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), the three PAHs and three metals (antimony, arsenic, iron) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), one metal (antimony) was retained as a COPC for subsurface soil at AOC 1 South. The maximum detected concentration of antimony was used in Step 3 (risk ratio using 95% UCLs) since the calculated 95% UCL was greater than the maximum detected concentration. The maximum detected concentration was in sample CAA01-SB15-1108. This was the only sample in which the antimony concentration exceeds the screening levels.

The average lead concentration in AOC 1 South subsurface soil is 478 mg/kg, which is greater than the lead screening level. Therefore, lead is considered to be present at a concentration of potential concern, and lead was

retained as a COPC in AOC 1 South subsurface soil. The maximum detected concentration of lead was in sample CAA01-SB15-08. As with antimony, this is the only sample in which the lead concentration exceeded the screening levels.

Groundwater

AOC 1 North

Tables 2.5 and 2.5a in Attachment A.1**,** present the risk-based screening evaluation for groundwater at AOC 1 North. Thirteen metals were retained for evaluation in Step 2: aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, and vanadium. Based on Step 2 (risk ratio using maximum detected concentrations), 11 metals were retained as COPCs for groundwater: aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, iron, manganese, selenium, and vanadium. The maximum lead concentration in AOC 1 North groundwater is 130 µg/L, and the average concentration is 48 µg/L. Both of these values are greater than the lead screening level. Therefore, lead is considered to be present at a concentration of potential concern, and lead was retained as a COPC in AOC 1 North groundwater. The potential risks and hazards associated with AOC 1 North groundwater area are primarily associated with results from monitoring well CAA01-DW03-1108; however, CAA01-DW01-1108 also would pose a slight risk.

AOC 1 South

Tables 2.6 and 2.6a in Attachment A.1**,** present the risk-based screening evaluation for groundwater at AOC 1 South. Seven metals (aluminum, arsenic, chromium, iron, lead, manganese, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), all COPCs were retained for groundwater. The maximum lead concentration in AOC 1 South groundwater is 94 µg/L, and the average concentration is 25 µg/L. Both of these values are greater than the lead screening level. Therefore, lead was retained as a COPC in groundwater. The risks and hazards associated with AOC 1 South groundwater are primarily associated with results from sample CAA01-DW04-1108. Concentrations in this sample were over an order of magnitude greater than the concentrations in the filtered sample from this well.

Risk Screening Summary

Based on the HHRS evaluation for AOC 1, AOC 1 North subsurface soil is the only media for which no further evaluation is necessary based on potential human health risks. Potential unacceptable risks were identified for surface soil for both AOC 1 North and South, associated with PAHs and metals. Potential unacceptable risks were identified for AOC 1 South subsurface soil associated with antimony; however the potential risk is associated with only one of the subsurface soil samples. Potential unacceptable risks were identified for AOC 1 North and South groundwater, associated with metals.

A.3.2 AOC 2

Risk Screening Results

The results of the risk evaluation for AOC 2 are presented in Tables 2.1 through 2.3a, Attachment A.2

Surface Soil

Tables 2.1 through 2.1b in Attachment A.2 present the risk-based screening evaluation for surface soil at AOC 2. Four metals (arsenic, chromium, iron, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), three metals (arsenic, chromium, iron,) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), the three metals were retained as COPCs for surface soil at AOC 2.

The risk associated with arsenic alone is below the acceptable level. Therefore, the potential unacceptable carcinogenic risk is primarily associated with chromium, and based on the assumption that all of the chromium present in the soil is in the hexavalent form of chromium.

Iron, the only contributor to the potential noncarcinogenic hazard is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard

is primarily associated with the iron concentration detected in sample CAA02-A2-DPB03-00-1098. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 4.4 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 8.8 mg/day iron (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children.

Subsurface Soil

Tables 2.2 through 2.2b in Attachment A.2 present the risk-based screening evaluation for subsurface soil at AOC 2. One PCB (Aroclor-1260) and eight metals (aluminum, arsenic, cadmium, chromium, cobalt, copper, iron, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), the PCB and four metals (arsenic, chromium, copper, and iron) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), one PCB (Aroclor-1260) and four metals (arsenic, chromium, copper, and iron) were retained as COPCs for subsurface soil at AOC 2. Aroclor-1260 was only detected in two of the 19 subsurface soil samples, both from the same location. Additionally, Aroclor-1260 alone does not pose a potential unacceptable risk above the acceptable level of $5x10^{-5}$. The risk associated with arsenic alone is also within the acceptable level. Therefore, the potential unacceptable carcinogenic risk is primarily associated with chromium, and based on the assumption that all of the chromium present in the soil is in the hexavalent form of chromium, which is unlikely. The potential unacceptable noncarcinogenic hazard is primarily associated with iron, which is a required human nutrient. Although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA02-A2-DPB04-09-1098. Ingestion of soil at the maximum detected concentration of iron [45,300 mg/kg, which would result in ingestion of 4.5 mg/day iron for an adult (45,300 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 9.1 mg/day iron (45,300 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children. Therefore, it is unlikely there would be any adverse effects associated with exposure to iron in the subsurface soil at the site; and the HI associated with copper alone is below the risk-ratio screening benchmark of 0.5.

Thallium did not have residential or industrial soil RSLs in the November 2010 RSL Table, which was the current table version of the RSL table at the time the HHRS was performed, and thallium was not detected in the background data set. However, there are now thallium residential and industrial soil RSLs on the updated June 2011 RSL Table. Thallium was detected in one of the 23 subsurface soil samples at a concentration of 0.84 mg/kg, qualified with an L data validation qualifier (L indicates that the concentration may be biased low). This concentration exceeds the adjusted residential soil RSL of 0.078 mg/kg, and the unadjusted residential soil RSL (0.78 mg/kg). This concentration does not exceed the adjusted industrial soil RSL of 1 mg/kg (or the unadjusted industrial soil RSL of 10 mg/kg). The one sample location where thallium was detected (CAA02-A2-TP02-N-1199) is within the area that is going to be excavated as part of the respiratory cartridge removal action that is going to be implemented at AOC 2.

Groundwater

Tables 2.3 and 2.3a in Attachment A.2**,** present the risk-based screening evaluation for groundwater at AOC 2. Eleven metals were retained for evaluation in Step 2: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, and vanadium. Based on Step 2 (risk ratio using maximum detected concentrations), 10 metals were identified as COPCs; nickel was eliminated as a COPC. The maximum lead concentration is 95 µg/L, which is greater than the lead screening level. The average lead concentration, 46 µg/L, is also greater than the lead screening level. Therefore, lead was retained as a COPC in groundwater.

Thallium did not have a tap water RSL in the November 2010 RSL Table, which was the current table version of the RSL table at the time the HHRS was performed, and thallium was not detected in the background data set.

However, there is now a thallium tap water RSL on the updated June 2011 RSL Table. Thallium was detected in two of the four groundwater samples at concentrations of 1.2 L μg/L and 2 J μg/L /kg (the J qualifier indicates the concentration is estimated). These concentrations exceed the adjusted tap water RSL of 0.037 μg/L, and the unadjusted tap water RSL (0.37 μg/L).

Risk Screening Summary

Based on the HHRS evaluation, potential unacceptable risks were identified for surface soil, subsurface soil, and groundwater. The carcinogenic risk associated with soil is primarily associated with chromium. As discussed above, this is based on the assumption that all of the chromium present is in the hexavalent form. It is unlikely that the chromium is present in this form, and more likely it is in a trivalent state. Chromium is generally found in natural soil in the trivalent form, unless activities at the site have resulted in the release or formation of hexavalent chromium. Therefore, it is likely there would be no unacceptable risks associated with exposure to surface or subsurface soil. The carcinogenic risk associated with groundwater is due to the arsenic and chromium detected in the groundwater.

Potentially unacceptable noncarcinogenic hazards were identified for surface soil and groundwater. The hazards associated with the surface soil were primarily associated with iron, an essential human nutrient. For groundwater, the noncarcinogenic hazard was associated with a number of metals.

A.3.3 AOC 6

Risk Screening Results

The risk-based screening evaluation for surface soil, subsurface soil, and groundwater at AOC 6 was conducted for three primary areas: 1) the Ammonia Settling Pit area, 2) the 1918 Drum Storage area, and 3) the TNT Graining House area. The RSLs used for the risk-based screening evaluation for the 1918 Drum Storage area were updated to the values on the June 2011 RSL Table (USEPA, 2011). The 1918 Drum Storage area is being proposed for no further action (see Section 5.3.3), and therefore, it was necessary to ensure that latest screening values available (including the available thallium RSLs) were used in the evaluation.

For surface water and sediment, the risk-based screening evaluation was conducted for two areas: 1) the Ammonia Settling Pit area, and 2) the TNT Graining House area. The results of the risk evaluation for AOC 6 are presented in Tables 2.1 through 2.18a, Attachment A.3.

Surface Soil

Ammonia Settling Pit Area

Tables 2.1 and 2.1a in Attachment A.3**,** present the risk-based screening evaluation for surface soil at the Ammonia Settling Pit area at AOC 6. Three PAHs [benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene] were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), no COPCs were retained. Therefore, exposure to surface soil at the Ammonia Settling Pit area at AOC 6 would not be expected to result in any unacceptable human health risks based on potential human exposure.

1918 Drum Storage Area

Tables 2.2 and 2.2a in Attachment A.3 present the risk-based screening evaluation for surface soil at the 1918 Drum Storage area at AOC 6. One metal (aluminum) was retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), no COPCs were retained. Therefore, exposure to surface soil at the 1918 Drum Storage area at AOC 6 would not be expected to result in any unacceptable human health risks based on potential human exposure.

TNT Graining House Area

Tables 2.3 through 2.3b in Attachment A.3 present the risk-based screening evaluation for surface soil at the AOC 6 TNT Graining House area. Seven explosives (2,4-dinitrotoluene, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, and 4-amino-2,6-dinitrotoluene) and six metals

(aluminum, arsenic, chromium, iron, lead, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), three explosives (2,4-dinitrotoluene, 2,4,6-trinitrotoluene, and 2-nitrotoluene) and three metals (arsenic, chromium, and iron) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), the three explosives and two metals (arsenic and chromium) were retained as COPCs for surface soil at the AOC 6 TNT Graining House area. The potential unacceptable carcinogenic risk is primarily associated with the 2,4,6-trinitrotoluene and chromium, both of which individually exceed the benchmark carcinogenic level of 5×10^{-5}.

Thallium did not have residential or industrial soil RSLs in the November 2010 RSL Table, which was the current table version of the RSL table at the time the HHRS was performed, and thallium was not detected in the background data set. However, there are now thallium residential and industrial soil RSLs on the updated June 2011 RSL Table. Thallium was detected in one of the seven surface soil samples at a concentration of 0.18 mg/kg, qualified with a J data validation qualifier. This concentration exceeds the adjusted residential soil RSL of 0.078 mg/kg, but does not exceed the unadjusted residential soil RSL (0.78 mg/kg). This concentration does not exceed the adjusted industrial soil RSL of 1 mg/kg (or the unadjusted industrial soil RSL of 10 mg/kg).

The average lead concentration in the TNT Graining House area surface soil is 119 mg/kg, which is less than the lead screening level. Therefore, lead is not considered to be present at a concentration of potential concern, and lead was eliminated as a COPC in the AOC 6 TNT Graining House area surface soil.

Subsurface Soil

Ammonia Settling Pit Area

Tables 2.4 and 2.4a in Attachment A.3 present the risk-based screening evaluation for subsurface soil at the Ammonia Settling Pit area at AOC 6. One metal (aluminum) was retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentration), aluminum was not retained as a COPC. Therefore, exposure to the subsurface soil would not be expected to result in any unacceptable human health risks.

1918 Drum Storage Area

Table 2.5 in Attachment A.3 presents the risk-based screening evaluation for subsurface soil at the 1918 Drum Storage area at AOC 6. Two metals (aluminum and thallium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentration), aluminum and thallium were not retained as COPCs. Therefore, exposure to subsurface soil at the 1918 Drum Storage area at AOC 6 would not be expected to result in any unacceptable human health risks based on potential human exposure and risk.

TNT Graining House Area

Tables 2.6 through 2.6b in Attachment A.3 present the risk-based screening evaluation for subsurface soil at the AOC 6 TNT Graining House area. Four explosives (2,4-dinitrotoluene, 1,3-dinitrobenzene, 2,4,6-trinitrotoluene, and 4-amino-2,6-dinitrotoluene) and five metals (aluminum, arsenic, chromium, iron, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), two explosives (2,4-dinitrotoluene and 2,4,6-trinitrotoluene) and three metals (arsenic, chromium, and iron) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), 2,4-dinitrotoluene, 2,4,6-trinitrotoluene, arsenic, and chromium were retained as COPCs for subsurface soil at the AOC 6 TNT Graining House area. The potential unacceptable carcinogenic risk is primarily associated with the 2,4,6-trinitrotoluene and chromium, both of which individually exceed the benchmark carcinogenic level of 5×10^{-5}.

Thallium did not have residential or industrial soil RSLs in the November 2010 RSL Table, which was the current table version of the RSL table at the time the HHRS was performed, and thallium was not detected in the background data set. However, there are now thallium residential and industrial soil RSLs on the updated June 2011 RSL Table. Thallium was detected in one of the seven subsurface soil samples at a concentration of 0.07 mg/kg, qualified with a J data validation qualifier. This concentration is below the adjusted residential soil RSL of 0.078 mg/kg and adjusted industrial soil RSL of 1 mg/kg.

Groundwater

Ammonia Settling Pit Area

Tables 2.7 and 2.7a in Attachment A.3 present the risk-based screening evaluation for groundwater at the AOC 6 Ammonia Settling Pit area. Eight metals (aluminum, arsenic, chromium, cobalt, iron, lead, manganese, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), six metals (aluminum, arsenic, chromium, cobalt, iron, and manganese) were retained as COPCs. The maximum lead concentration in groundwater is 22 µg/L, which is greater than the lead screening level. The average lead concentration is 11 µg/L , which is below the screening level. Therefore, lead was not retained as a COPC in groundwater.

1918 Drum Storage Area

Tables 2.8 and 2.8a in Attachment A.3 present the risk-based screening evaluation for groundwater at the AOC 6 1918 Drum Storage area. Twelve metals were retained for evaluation in Step 2: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, iron, lead, manganese, nickel, thallium, and vanadium. Based on Step 2 (risk ratio using maximum detected concentrations), all of the metals except nickel were identified as COPCs. The maximum lead concentration in groundwater is 50 µg/L, which is greater than the lead screening level. The average lead concentration is 25 µg/L, which is also above the screening level. Therefore, lead was retained as a COPC in groundwater.

TNT Graining House Area

Tables 2.9 and 2.9a in Attachment A.3 present the risk-based screening evaluation for groundwater at the AOC 6 TNT Graining House area. Nine metals (aluminum, arsenic, beryllium, chromium, cobalt, iron, lead, manganese, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), all metals were identified as COPCs. The maximum lead concentration in groundwater is 72 µg/L, and the average concentration is 37 µg/L, which are greater than the lead screening level. Therefore, lead was retained as a COPC in groundwater.

Surface Water

Ammonia Settling Pit Area

Table 2.10 in Attachment A.3 presents the risk-based screening evaluation for surface water at the AOC 6 Ammonia Settling Pit area. No COPCs were retained for evaluation in Step 2. Therefore, exposure to surface water would not be expected to result in any unacceptable human health risks based on potential human exposure and risk. One SVOC (di-n-octylphthalate, the only detected SVOC) does not have any available screening criteria; potential risks associated with this constituent could not be evaluated.

TNT Graining House Area

Table 2.11 in Attachment A.3 presents the risk-based screening evaluation for surface water at the AOC 6 TNT Graining House area. No COPCs were retained for evaluation in Step 2. Therefore, exposure to surface water would not be expected to result in any unacceptable human health risks based on potential human exposure.

Thallium did not have a tap water RSL in the November 2010 RSL Table, which was the current table version of the RSL table at the time the HHRS was performed, and thallium was not detected in the background data set. However, there is now a thallium tap water RSL on the updated June 2011 RSL Table. Thallium was detected in the one surface water sample at a concentration of 1.7 J µg/L. This concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 µg/L), but does not exceed the unadjusted screening level (tap water RSL times ten, 3.7 µg/L).

Sediment

Ammonia Settling Pit Area

Table 2.12 in Attachment A.3 presents the risk-based screening evaluation for surface sediment (0 – 4 inches) at the AOC 6 Ammonia Settling Pit area. No COPCs were retained for evaluation in Step 2. Therefore, exposure to

surface sediment would not be expected to result in any unacceptable human health risks based on potential human exposure and risk.

Tables 2.13 and 2.13a in Attachment A.3 present the risk-based screening evaluation for subsurface sediment (4-8 inches) at the AOC 6 Ammonia Settling Pit area. Two metals (arsenic and chromium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), no COPCs were retained. Therefore, exposure to subsurface sediment at the AOC 6 Ammonia Settling Pit area would not be expected to result in any unacceptable human health risks based on potential human exposure and risk.

TNT Graining House Area

Tables 2.14 and 2.14a in Attachment A.3 present the risk-based screening evaluation for surface sediment (0-4inches) at the AOC 6 TNT Graining House area. Two metals (arsenic and chromium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), no COPCs were retained. Therefore, exposure to surface sediment (0 – 4 inches) at the AOC 6 TNT Graining House area would not be expected to result in any unacceptable human health risks based on potential human exposure and risk. One SVOC (di-n-octylphthalate, one of the two SVOCs detected in the sediment) did not have any available screening criteria; potential risks associated with this constituent could not be evaluated.

Tables 2.15 and 2.15a in Attachment A, Attachment 3**,** present the risk-based screening evaluation for subsurface sediment (4 – 8 inches) at the AOC 6 TNT Graining House area. One metal (arsenic) was retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), no COPCs were retained. Therefore, exposure to subsurface sediment (4 – 8 inches) at the AOC 6 TNT Graining House area would not be expected to result in any unacceptable human health risks based on potential human exposure and risk.

Risk Screening Summary

Exposure to surface soil, surface water, or sediment within the Ammonia Settling Pit Area would not result in any unacceptable risks. Exposure to subsurface soil may result in an unacceptable risk; however, this risk is associated with chromium. As discussed previously, the risk assessment assumed all of the chromium present in the soil was hexavalent chromium, and it is unlikely that this is the case. Exposure to groundwater could also result in potential unacceptable human health risks, associated with exposure to metals.

Exposure to surface soil and subsurface soil within the 1918 Drum Storage Area would not result in any unacceptable risks. Exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals.

Exposure to surface and subsurface soil within the TNT Graining House Area could result in potential unacceptable risks associated with explosives (primarily 2,4,6-trinitrotoluene) and metals. Exposure to groundwater could also result in potential unacceptable human health risks, associated with exposure to metals. Exposure to surface water and sediment would not result in any unacceptable risks.

A.3.4 AOC 7

Risk Screening Results

The results of the risk evaluation for AOC 7 are presented in Tables 2.1 through 2.3a, Attachment A.4.

Surface Soil

Tables 2.1 through 2.1b in Attachment A.4 present the risk-based screening evaluation for surface soil at AOC 7. Seven metals (aluminum, arsenic, chromium, cobalt, iron, lead, and manganese) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), five metals (aluminum, arsenic, chromium, iron, and manganese) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), three metals (arsenic, chromium, iron) were retained as a COPC for surface soil at AOC 7. The potential unacceptable carcinogenic risk is primarily associated with chromium, which individually exceeds the benchmark carcinogenic level of 5×10^{-5}. As discussed previously, it was assumed that all of the chromium present in the soil is in the hexavalent form of chromium. It is unlikely that the chromium is present in this form, and more likely it is in a trivalent state. Chromium is generally found in natural soil in the trivalent form, unless activities at the site

have resulted in the release or formation of hexavalent chromium. Therefore, it is likely there would be no unacceptable risks associated with exposure to the surface soil. The potential unacceptable noncarcinogenic risk is primarily associated with iron, which individually exceed the benchmark noncarcinogenic level of 0.5. Iron is an essential human nutrient and is toxic only at very high doses; however iron was handled the same way as other detected constituents in the HHRS because human health-based screening criteria are available for this constituents. However, the iron screening criteria is based on a provisional toxicity value that increases the uncertainty associated with the screening risk evaluation. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA07-SS02-1008. Ingestion of soil at the maximum detected concentration of iron [213,000 mg/kg, which would result in ingestion of 21.3 mg/day iron for an adult (213,000 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 42.6 mg/day iron (213,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is slightly above the UL of 40 mg/day for children. However, it is unlikely there would be any adverse effects associated with exposure to iron in the surface soil at the site.

The average lead concentration in AOC 7 surface soil is 186 mg/kg, which is less than the lead screening level. Therefore, lead is not considered to be present at a concentration of potential concern, and lead was eliminated as a COPC in AOC 7 surface soil.

Subsurface Soil

Tables 2.2 through 2.3 in Attachment A.4**,** present the risk-based screening evaluation for subsurface soil at AOC 7. Three metals (aluminum, arsenic, and manganese) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations, Table 2.2a), no COPCs were retained for the subsurface soil at AOC 7. Therefore, exposure to subsurface soil at AOC 7 would not be expected to result in any unacceptable human health risks based on potential human exposure and risk.

The one subsurface soil collected from the subsurface soil beneath the Can Pit was evaluated separately from the rest of the subsurface soil samples (Table 2.3, Attachment A.4), as this sample was collected from a depth considered deeper than typical human exposure (about 12-14 feet below ground surface) and this sample represents anything that could have leached from the Can Pit to soil beneath the Can Pit. There were no COPCs retained in the Step 1 evaluation. Therefore, if a human receptor did contact this deep soil beneath the Can Pit, it would not be expected to result in any unacceptable human health risks.

Groundwater

Tables 2.4 and 2.4a in Attachment A.4**,** present the risk-based screening evaluation for groundwater at AOC 7. One VOC (ethylbenzene) and nine metals (aluminum, arsenic, chromium, iron, lead, manganese, nickel, selenium, and vanadium) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), ethylbenzene, aluminum, arsenic, chromium, iron, manganese, and vanadium were retained as COPCs; nickel and selenium were eliminated as COPCs. Ethylbenzene was detected in only one sample; the result was J-qualified meaning detected below the reporting limit. The maximum lead concentration in AOC 7 groundwater is 31 µg/L, which is greater than the lead screening level of 15 µg/L, however the average concentration is 10 µg/L, which is below the lead screening level.

Risk Screening Summary

Exposure to surface soil may result in an unacceptable risk. The potential unacceptable carcinogenic risk for surface soil is associated with chromium. It was assumed that all of the chromium detected in the soil is in the hexavalent form, which is highly unlikely. Therefore, it is likely there would be no unacceptable carcinogenic risk associated with exposure to the surface or subsurface soil. The potential unacceptable noncarcinogenic hazard for surface soil is associated with iron, which is a required human nutrient. It is unlikely there would be any adverse effects associated with exposure to iron in the subsurface soil at the site. Therefore, it is unlikely there would be any adverse effects associated with exposure to surface or subsurface soil.

Exposure to groundwater may result in an unacceptable risk to future receptors. The carcinogenic risk is associated with arsenic and chromium (although it is unlikely the chromium detected in the groundwater is in the hexavalent state assumed for the risk screening, and therefore, unlikely any risks associated with the chromium). The noncarcinogenic risk is associated with additional metals (aluminum, iron, manganese, and vanadium).

A.3.5 AOC 8

Risk Screening Results

The results of the risk evaluation for AOC 8 are presented in Tables 2.1 through 2.3a, Attachment A.5.

Surface Soil

Tables 2.1 through 2.1b in Attachment A.5 present the risk-based screening evaluation for surface soil at AOC 8. One PAH [benzo(b)fluoranthene], one PCB (Aroclor-1260), and two metals (arsenic and chromium,) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), the PAH, the PCB, and the two metals (arsenic and chromium) were carried forward to Step 3. Based on Step 3 (risk ratio using 95% UCLs), one PAH [benzo(b)fluoranthene], one PCB (Aroclor-1260) and two metals (arsenic and chromium) were retained as COPCs for surface soil at AOC 8. The potential unacceptable carcinogenic risk is primarily associated with chromium, which individually exceed the benchmark carcinogenic level of 5×10^{-5}. As discussed previously, it was assumed that all of the chromium present in the soil is in the hexavalent form of chromium. It is unlikely that the chromium is present in this form, and more likely it is in a trivalent state. Therefore, it is likely there would be no unacceptable risks associated with exposure to the surface soil.

Thallium did not have residential or industrial soil RSLs in the November 2010 RSL Table, which was the current table version of the RSL table at the time the HHRS was performed, and thallium was not detected in the background data set. However, there are now thallium residential and industrial soil RSLs on the updated June 2011 RSL Table. Thallium was detected in two of the nine surface soil samples at concentrations of 0.06 J mg/kg and 0.08 J mg/kg. The maximum concentration slightly exceeds the adjusted residential soil RSL of 0.078 mg/kg, but not the unadjusted residential soil RSL (0.78 mg/kg). This concentration does not exceed the adjusted industrial soil RSL of 1 mg/kg (or the unadjusted industrial soil RSL of 10 mg/kg).

Subsurface Soil

Tables 2.2 through 2.2b in Attachment A.5 present the risk-based screening evaluation for subsurface soil at AOC 8. One PCB (Aroclor-1260) and one metal (arsenic) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), no COPCs were retained for evaluation in Step 3. Therefore, exposure to subsurface soil at AOC 8 would not be expected to result in any unacceptable human health risks based on potential human exposure and risk.

Groundwater

Tables 2.3 and 2.3a in Attachment A.5 present the risk-based screening evaluation for groundwater at AOC 8. One VOC (tetrachloroethene) and three metals (arsenic, iron, and manganese) were retained for evaluation in Step 2. Based on Step 2 (risk ratio using maximum detected concentrations), tetrachloroethene and arsenic were retained as COPCs. Tetrachloroethene was detected in only one sample; the result was J-qualified meaning detected below the reporting limit.

Risk Screening Summary

Exposure to surface soil may result in an unacceptable risk. The potential unacceptable carcinogenic risk for surface is associated with chromium. It was assumed that all of the chromium detected in the soil is in the hexavalent form, which is highly unlikely. Therefore, it is likely there would be no unacceptable carcinogenic risk associated with exposure to the surface or subsurface soil. There would be no unacceptable noncarcinogenic hazards associated with exposure to soil.

Exposure to groundwater may result in an unacceptable risk to future receptors. The carcinogenic risk is associated with tetrachloroethene and arsenic.

A.4 Human Health Risk Screening Conclusion

The preliminary human health risk based screening indicates that exposure to subsurface soil from AOC 1 North would not result in any unacceptable risks to human health. However, exposure to surface soil (PAHs and metals) at AOC 1 North and South, subsurface soil (antimony in one subsurface soil sample) at AOC 1 South, and groundwater (metals) at AOC 1 North and South could potentially result in unacceptable risks.

At AOC 2, exposures to surface soil (metals), subsurface soil (PCB and metals), and groundwater (metals) could potentially result in unacceptable risks. The carcinogenic risk estimated for the soil is primarily associated with chromium. As discussed above, this is based on the assumption that all of the chromium present is in the hexavalent form. It is unlikely that the chromium is present in this form, and more likely it is in a trivalent state. Therefore, it is likely there would be no unacceptable risks associated with exposure to surface or subsurface soil. The carcinogenic risk associated with groundwater is due to the arsenic and chromium detected in the groundwater. Potentially unacceptable noncarcinogenic hazards were identified for all media. The hazards associated with the surface and subsurface soil were primarily associated with iron, an essential human nutrient. For groundwater, the noncarcinogenic hazard was associated with a number of metals.

At AOC 6, exposure to surface soil at the Ammonia Settling Pit area, surface and subsurface soil at the 1918 Drum Storage Area, and surface water and sediment at the Ammonia Settling Pit area and TNT Graining House area would not result in any unacceptable risks to human health. However, exposure to surface soil (explosives and metals) and subsurface soil (explosives and metals) at the TNT Graining House area, subsurface soil (chromium) at the Ammonia Settling Pit area, and groundwater (metals) at the Ammonia Settling Pit area, 1918 Drum Storage Area, and TNT Graining House area could potentially result in unacceptable risks. As discussed previously for subsurface soil at the Ammonia Settling Pit area, the risk assessment assumed all of the chromium present in the soil was hexavalent chromium, and it is unlikely that this is the case.

At AOC 7, exposures to surface soil (metals), and groundwater (ethylbenzene and metals) could potentially result in unacceptable risks. The carcinogenic risk associated with soil is primarily associated with chromium. As discussed above, this is based on the assumption that all of the chromium present is in the hexavalent form. It is unlikely that the chromium is present in this form, and more likely it is in a trivalent state. Therefore, it is likely there would be no unacceptable risks associated with exposure to surface or subsurface soil. Potentially unacceptable noncarcinogenic hazards associated with the surface soil were primarily associated with iron, an essential human nutrient. For groundwater, the noncarcinogenic hazard was associated with a number of metals.

At AOC 8, exposures to surface soil [benzo(b)fluoranthene, Aroclor-1260, and arsenic, chromium], and groundwater (tetratchloroethene and arsenic) could potentially result in unacceptable risks. For soil, the carcinogenic risk is primarily associated with chromium. As discussed above, this is based on the assumption that all of the chromium present is in the hexavalent form. It is unlikely that the chromium is present in this form, and more likely it is in a trivalent state. Therefore, it is likely there would be no unacceptable risks associated with exposure to surface or subsurface soil.

It should be noted that the groundwater is not currently used as a potable water supply at the site or the base, and is extremely unlikely that is ever would be used as a potable water supply.

A.5 References

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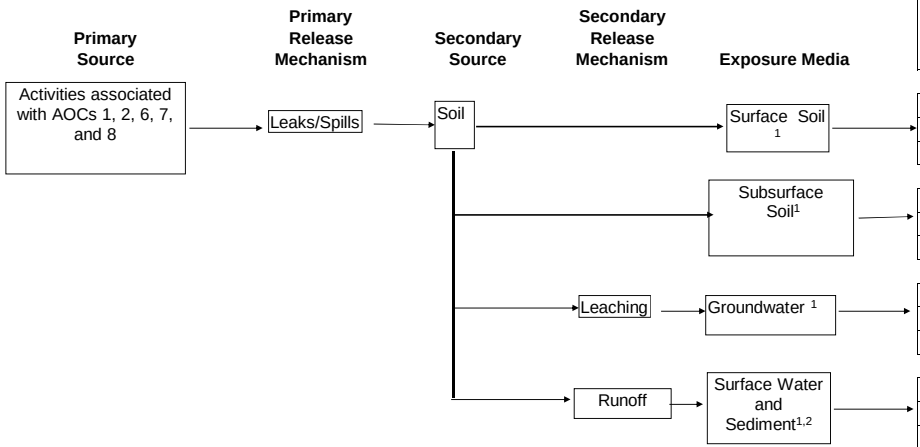

	Potential Human Receptors					
	Current/Future				Future	
Exposure Route	**Recreational Users/Visitors**	**Trespassers**	**Maintenance Worker**	**Industrial Worker**	**Residents**	**Construction Worker**
Ingestion	X	X	X	X	X	X
Dermal Contact	X	X	X	X	X	X
Inhalation	X	X	X	X	X	X
Ingestion	X	X	X	X	X	X
Dermal Contact	X	X	X	X	X	X
Inhalation	X	X	X	X	X	X
Ingestion	NA	NA	NA	NA	X	NA
Dermal Contact	NA	NA	NA	NA	X	X
Inhalation	NA	NA	NA	NA	X	X
Ingestion	X	X	NA	NA	NA	NA
Dermal Contact	X	X	NA	NA	NA	NA
Inhalation	NA	NA	NA	NA	NA	NA

[1] Screening level evaluation for AOCs 1, 2, 6, 7, and 8.
[2] For recreational user/visitor, current exposure to surface sediment and future exposure to subsurface sediment.

NA - Not Applicable or pathway is incomplete
X - Potentially complete exposure pathways

FIGURE A-1
Conceptual Site Model for HHRA
AOCs 1, 2, 6, 7, and 8
Cheatham Annex Areas of Concern, Williamsburg, Virginia

Human Health Risk Screening Tables

Attachment A.1—AOC 1

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil AOC 1 North	100-42-5	Styrene	3.0E-03 J	3.0E-03 J	MG/KG	CAA01-SS09-1108; CAA01-SS16-1108	2/11	0.013 - 0.017	3.0E-03	N/A	N/A	6.3E+03 NS	NO	3.6E+03 NS	NO	BSL
	100-52-7	Benzaldehyde	2.3E-01 J	2.6E-01 J	MG/KG	CAA01-SS04-1108	2/11	0.41 - 0.57	2.6E-01	N/A	N/A	7.8E+03 NS	NO	1.0E+04 NMS	NO	BSL
	56-55-3	**Benzo(a)anthracene**	**3.3E-01 J**	**3.7E-01 L**	**MG/KG**	**CAA01-SS11-1108**	**2/11**	**0.41 - 0.57**	**3.7E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
	50-32-8	**Benzo(a)pyrene**	**3.0E-01 J**	**7.5E-01 L**	**MG/KG**	**CAA01-SS11-1108**	**2/11**	**0.41 - 0.57**	**7.5E-01**	N/A	**N/A**	**1.5E-02 C**	**YES**	**2.1E-01 C**	**YES**	**ASL-Res, ASL-Ind**
	205-99-2	**Benzo(b)fluoranthene**	**2.4E-01 J**	**2.4E+00 L**	**MG/KG**	**CAA01-SS11-1108**	**3/11**	**0.41 - 0.57**	**2.4E+00**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	191-24-2	Benzo(g,h,i)perylene	1.0E+00 L	1.0E+00 L	MG/KG	CAA01-SS11-1108	1/11	0.41 - 0.57	1.0E+00	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	207-08-9	Benzo(k)fluoranthene	5.4E-01	8.2E-01 L	MG/KG	CAA01-SS11-1108	2/11	0.41 - 0.57	8.2E-01	N/A	N/A	1.5E+00 C	NO	2.1E+01 C	NO	BSL
	218-01-9	Chrysene	4.4E-01	1.4E+00 L	MG/KG	CAA01-SS11-1108	2/11	0.41 - 0.57	1.4E+00	N/A	N/A	1.5E+01 C	NO	2.1E+02 C	NO	BSL
	53-70-3	**Dibenz(a,h)anthracene**	**3.3E-01 L**	**3.3E-01 L**	**MG/KG**	**CAA01-SS11-1108**	**1/11**	**0.41 - 0.57**	**3.3E-01**	N/A	**N/A**	**1.5E-02 C**	**YES**	**2.1E-01 C**	**YES**	**ASL-Res, ASL-Ind**
	206-44-0	Fluoranthene	4.4E-01	4.4E-01	MG/KG	CAA01-SS05-1108	1/11	0.41 - 1	4.4E-01	N/A	N/A	2.3E+02 N	NO	2.2E+03 N	NO	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**7.5E-01 L**	**7.5E-01 L**	**MG/KG**	**CAA01-SS11-1108**	**1/11**	**0.41 - 0.57**	**7.5E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
	129-00-0	Pyrene	2.9E-01 L	8.4E-01	MG/KG	CAA01-SS05-1108	2/11	0.41 - 1	8.4E-01	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	72-54-8	4,4'-DDD	1.7E-03 J	1.7E-03 J	MG/KG	CAA01-SS08-1108	1/11	0.004 - 0.0057	1.7E-03	N/A	N/A	2.0E+00 C	NO	7.2E+00 C	NO	BSL
	72-55-9	4,4'-DDE	2.3E-04 J	2.8E-03 J	MG/KG	CAA01-SS08-1108	6/11	0.004 - 0.0057	2.8E-03	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	1.8E-03 J	4.7E-03 J	MG/KG	CAA01-SS11-1108	5/11	0.004 - 0.0057	4.7E-03	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	959-98-8	Endosulfan I	2.9E-04 J	2.9E-04 J	MG/KG	CAA01-SS04-1108	1/11	0.002 - 0.0028	2.9E-04	N/A	N/A	3.7E+01 N	NO	3.7E+02 N	NO	BSL
	72-20-8	Endrin	2.7E-03 K	3.3E-03 J	MG/KG	CAA01-SS11-1108	2/11	0.004 - 0.0057	3.3E-03	N/A	N/A	1.8E+00 N	NO	1.8E+01 N	NO	BSL
	7421-93-4	Endrin aldehyde	2.1E-03 J	3.1E-03 J	MG/KG	CAA01-SS11-1108	2/11	0.004 - 0.0057	3.1E-03	N/A	N/A	1.8E+00 N	NO	1.8E+01 N	NO	BSL
	5103-74-2	gamma-Chlordane	1.9E-03 J	2.0E-03 J	MG/KG	CAA01-SS03-1208	2/11	0.002 - 0.0028	2.0E-03	N/A	N/A	1.6E+00 C*	NO	6.5E+00 C*	NO	BSL
	7429-90-5	**Aluminum**	**5.9E+03**	**1.8E+04**	**MG/KG**	**CAA01-SS06-1108**	**11/11**	**13 - 32**	**1.8E+04**	**1.2E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	8.0E-02 L	1.2E+00 L	MG/KG	CAA01-SS04-1108	4/11	3.8 - 12	1.2E+00	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
	7440-38-2	**Arsenic**	**1.5E+00**	**4.8E+01 L**	**MG/KG**	**CAA01-SS04-1108**	**11/11**	**0.63 - 2**	**4.8E+01**	**6.4E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.9E+01 J	1.2E+02	MG/KG	CAA01-SS11-1108	11/11	13 - 32	1.2E+02	5.3E+01	YES	1.5E+03 N	NO	1.9E+04 NM	NO	BSL
	7440-41-7	Beryllium	2.3E-01 J	7.8E-01	MG/KG	CAA01-SS11-1108	11/11	0.32 - 0.81	7.8E-01	5.9E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	8.0E-02 J	1.3E+00	MG/KG	CAA01-SS11-1108	6/11	0.32 - 1	1.3E+00	1.5E+00	NO	7.0E+00 N	N/A	8.0E+01 N	N/A	BBK
	7440-70-2	Calcium	3.2E+02 J	2.4E+04	MG/KG	CAA01-SS11-1108	11/11	320 - 810	2.4E+04	2.3E+03	YES	NA	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**5.3E+00**	**4.9E+01**	**MG/KG**	**CAA01-SS11-1108**	**11/11**	**0.63 - 2**	**4.9E+01**	**1.8E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	Cobalt	1.1E+00 J	9.0E+00 J	MG/KG	CAA01-SS02-1108	11/11	3.2 - 10	9.0E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	2.2E+00	3.3E+01	MG/KG	CAA01-SS04-1108	11/11	1.6 - 4.1	3.3E+01	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	57-12-5	Cyanide	2.9E+01	2.9E+01	MG/KG	CAA01-SS04-1108	1/11	0.55 - 0.85	2.9E+01	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7439-89-6	Iron	3.3E+03	1.7E+04	MG/KG	CAA01-SS16-1108	11/11	6.3 - 20	1.7E+04	2.0E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	8.0E+00	1.2E+02	MG/KG	CAA01-SS11-1108	11/11	0.63 - 2	1.2E+02	1.7E+01	YES	4.0E+02 NL	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	3.0E+02 J	1.9E+03	MG/KG	CAA01-SS11-1108	11/11	320 - 1000	1.9E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**3.0E+01**	**4.3E+02**	**MG/KG**	**CAA01-SS11-1108**	**11/11**	**0.95 - 3.1**	**4.3E+02**	**3.2E+02**	**YES**	**1.8E+02 N**	**YES**	**2.3E+03 N**	**NO**	**ASL-Res**
	7439-97-6	Mercury	7.0E-02 J	1.5E-01	MG/KG	CAA01-SS11-1108	3/11	0.11 - 0.18	1.5E-01	1.1E-01	YES	5.6E-01 N	NO	3.1E+01 N	NO	BSL
	7440-02-0	Nickel	2.8E+00 J	8.9E+00	MG/KG	CAA01-SS11-1108	11/11	2.5 - 8.2	8.9E+00	9.5E+00	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
	7440-09-7	Potassium	2.4E+02 J	8.9E+02	MG/KG	CAA01-SS11-1108	11/11	320 - 810	8.9E+02	7.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	3.1E-01 L	3.1E-01 L	MG/KG	CAA01-SS06-1108	1/11	2.2 - 7.2	3.1E-01	5.1E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-22-4	Silver	7.0E-02 J	5.5E-01 J	MG/KG	CAA01-SS11-1108	5/11	0.63 - 2	5.5E-01	2.1E+00	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	1.9E+01 J	4.8E+01 J	MG/KG	CAA01-SS04-1108	5/11	320 - 810	4.8E+01	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	**Vanadium**	**1.1E+01**	**4.1E+01**	**MG/KG**	**CAA01-SS06-1108**	**11/11**	**3.2 - 10**	**4.1E+01**	**2.8E+01**	**YES**	**3.9E+01 N**	**YES**	**5.2E+02 N**	**NO**	**ASL-Res**
	7440-66-6	Zinc	1.1E+01	8.7E+02	MG/KG	CAA01-SS11-1108	11/11	3.8 - 9.8	8.7E+02	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for Acenaphthene used as surrogate for Acenaphthylene.

RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.

RSL value for anthracene used as surrogate for phenanthrene.

RSL value for technical chlordane used as surrogate for gamma-chlordane.

The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

RSL value for manganese (water) used as surrogate for manganese.

RSL value for mercury (inorganic salts) used as surrogate for mercury.

RSL value for endosulfan used as surrogate for endosulfan I.

RSL value for endrin used as surrogate for endrin aldehyde.

RSL value for vanadium based on vanadium and compounds.

[7] Rationale Codes

Selection Reason:	Above Residential Soil Screening Levels (ASL-Res)
	Above Industrial Soil Screening Levels (ASL-Ind)
Deletion Reason:	Below Background (BBK)
	Below Screening Level (BSL)
	No Toxicity Information (NTX)
	Essential Nutrient (NUT)

COPC = Chemical of Potential Concern

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

J = Estimated Value

K = Biased High

L = Biased Low

C = Carcinogenic

C* = where: N SL < 100X C SL

N = Noncarcinogenic

S = Saturation

RSL = Regional Screening Levels

N/A = Not available or Not applicable

ND = Not detected

M = Concentration may exceed ceiling limit

TABLE 2.1a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 North - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)								
Benzo(a)anthracene	2 / 11	3.7E-01 L	CAA01-SS11-1108	1.5E-01	1E-06	NA	2E-06	NA
Benzo(a)pyrene	2 / 11	7.5E-01 L	CAA01-SS11-1108	1.5E-02	1E-06	NA	5E-05	NA
Benzo(b)fluoranthene	3 / 11	2.4E+00 L	CAA01-SS11-1108	1.5E-01	1E-06	NA	2E-05	NA
Dibenz(a,h)anthracene	1 / 11	3.3E-01 L	CAA01-SS11-1108	1.5E-02	1E-06	NA	2E-05	NA
Indeno(1,2,3-cd)pyrene	1 / 11	7.5E-01 L	CAA01-SS11-1108	1.5E-01	1E-06	NA	5E-06	NA
Metals (mg/kg)								
Aluminum	11 / 11	1.8E+04	CAA01-SS06-1108	7.7E+04	1	0.2	NA	Developmental, Neurological
Arsenic	11 / 11	4.8E+01 L	CAA01-SS04-1108	3.9E-01	1E-06	NA	1E-04	NA
Chromium	11 / 11	4.9E+01	CAA01-SS11-1108	2.9E-01	1E-06	NA	2E-04	NA
Manganese	11 / 11	4.3E+02	CAA01-SS11-1108	1.8E+03	1	0.2	NA	CNS
Vanadium	11 / 11	4.1E+01	CAA01-SS06-1108	3.9E+02	1	0.1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**0.6**		
Cumulative Corresponding Cancer Risk[d]							**4E-04**	

Total Developmental HI =	0.2
Total Neurological/CNS HI =	0.5
Total Kidney HI =	0.1

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

L = Biased Low

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.1b

Step 3 Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 North - Surface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)									
Benzo(a)anthracene	2 / 11	3.7E-01	Max	5, 7	1.5E-01	1E-06		2E-06	NA
Benzo(a)pyrene	2 / 11	4.4E-01	95% KM-t	5	1.5E-02	1E-06		3E-05	NA
Benzo(b)fluoranthene	3 / 11	9.0E-01	95% KM-t	1, 2	1.5E-01	1E-06		6E-06	NA
Dibenz(a,h)anthracene	1 / 11	2.4E-01	95% Stud-t	5	1.5E-02	1E-06		2E-05	NA
Indeno(1,2,3-cd)pyrene	1 / 11	3.5E-01	95% Stud-t	5	1.5E-01	1E-06		2E-06	NA
Metals (mg/kg)									
Arsenic	11 / 11	4.8E+01	Max	5, 7	3.9E-01	1E-06		1E-04	NA
Chromium	11 / 11	2.2E+01	G-App	1, 3, 4	2.9E-01	1E-06		8E-05	NA
Cumulative Corresponding Hazard Index[c]							**NA**		
Cumulative Corresponding Cancer Risk[d]								**3E-04**	

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA.February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (M); 95% Student's-T test UCL (95% Stud-t); 95% Kaplan-Meier (t) UCL (95% KM-t); Approximate Gamma UCL (G-App)

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Maximum detected concentration because sample set less than 5 samples.

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil AOC 1 South	78-93-3	2-Butanone	7.0E-03 J	8.0E-03 J	MG/KG	CAA01-SS15-1108	2/8	0.013 - 0.017	8.0E-03	N/A	N/A	2.8E+03 N	NO	2.0E+04	NMS	NO	BSL
	67-64-1	Acetone	3.4E-02	3.4E-02	MG/KG	CAA01-SS18-1208	1/8	0.013 - 0.017	3.4E-02	N/A	N/A	6.1E+03 N	NO	6.3E+04	NMS	NO	BSL
	100-42-5	Styrene	3.3E-02	3.3E-02	MG/KG	CAA01-SS10-1108	1/8	0.013 - 0.017	3.3E-02	N/A	N/A	6.3E+03 NS	NO	3.6E+03	NS	NO	BSL
	108-88-3	Toluene	2.0E-03 J	2.0E-03 J	MG/KG	CAA01-SS13-1108	1/8	0.013 - 0.017	2.0E-03	N/A	N/A	5.0E+03 NS	NO	4.5E+03	NS	NO	BSL
	208-96-8	Acenaphthylene	3.6E-01 J	3.6E-01 J	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	3.6E-01	N/A	N/A	3.4E+02 N	NO	3.3E+03	N	NO	BSL
	120-12-7	Anthracene	8.0E-01	8.0E-01	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	8.0E-01	N/A	N/A	1.7E+03 N	NO	1.7E+04	NM	NO	BSL
	56-55-3	**Benzo(a)anthracene**	**1.9E+00**	**1.9E+00**	**MG/KG**	**CAA01-SS15-1108**	**1/8**	**0.41 - 0.57**	**1.9E+00**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00**	**C**	**NO**	**ASL-Res**
	50-32-8	**Benzo(a)pyrene**	**1.5E+00**	**1.5E+00**	**MG/KG**	**CAA01-SS15-1108**	**1/8**	**0.41 - 0.57**	**1.5E+00**	N/A	**N/A**	**1.5E-02 C**	**YES**	**2.1E-01**	**C**	**YES**	**ASL-Res, ASL-Ind**
	205-99-2	**Benzo(b)fluoranthene**	**1.4E+00**	**1.4E+00**	**MG/KG**	**CAA01-SS15-1108**	**1/8**	**0.41 - 0.57**	**1.4E+00**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00**	**C**	**NO**	**ASL-Res**
	191-24-2	Benzo(g,h,i)perylene	8.2E-01	8.2E-01	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	8.2E-01	N/A	N/A	1.7E+01 N	NO	1.7E+03	N	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.1E+00	1.1E+00	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	1.1E+00	N/A	N/A	1.5E+00 C	NO	2.1E+01	C	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	4.5E-01 J	7.9E-01	MG/KG	CAA01-SS19-1208	2/8	0.41 - 0.57	7.9E-01	N/A	N/A	3.5E+01 C*	NO	1.2E+02	C	NO	BSL
	86-74-8	Carbazole	6.1E-01	6.1E-01	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	6.1E-01	N/A	N/A	N/A	N/A	N/A		N/A	NTX
	218-01-9	Chrysene	1.8E+00	1.8E+00	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	1.8E+00	N/A	N/A	1.5E+01 C	NO	2.1E+02	C	NO	BSL
	53-70-3	**Dibenz(a,h)anthracene**	**2.7E-01 J**	**2.7E-01 J**	**MG/KG**	**CAA01-SS15-1108**	**1/8**	**0.41 - 0.57**	**2.7E-01**	N/A	**N/A**	**1.5E-02 C**	**YES**	**2.1E-01**	**C**	**YES**	**ASL-Res, ASL-Ind**
	206-44-0	Fluoranthene	4.9E+00	4.9E+00	MG/KG	CAA01-SS15-1108	1/8	0.41 - 1	4.9E+00	N/A	N/A	2.3E+02 N	NO	2.2E+03	N	NO	BSL
	86-73-7	Fluorene	6.6E-01	6.6E-01	MG/KG	CAA01-SS15-1108	1/8	0.41 - 0.57	6.6E-01	N/A	N/A	2.3E+02 N	NO	2.2E+03	N	NO	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**7.8E-01**	**7.8E-01**	**MG/KG**	**CAA01-SS15-1108**	**1/8**	**0.41 - 0.57**	**7.8E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00**	**C**	**NO**	**ASL-Res**
	85-01-8	Phenanthrene	5.2E+00	5.2E+00	MG/KG	CAA01-SS15-1108	1/8	0.41 - 1	5.2E+00	N/A	N/A	1.7E+02 N	NO	1.7E+04	NM	NO	BSL
	129-00-0	Pyrene	4.4E+00	4.4E+00	MG/KG	CAA01-SS15-1108	1/8	0.41 - 1	4.4E+00	N/A	N/A	1.7E+02 N	NO	1.7E+03	N	NO	BSL
	72-54-8	4,4'-DDD	2.3E-04 J	1.0E-03 J	MG/KG	CAA01-SS15-1108	4/8	0.004 - 0.0057	1.0E-03	N/A	N/A	2.0E+00 C	NO	7.2E+00	C	NO	BSL
	72-55-9	4,4'-DDE	3.4E-04 J	5.6E-04 J	MG/KG	CAA01-SS14-1108	3/8	0.004 - 0.0057	5.6E-04	N/A	N/A	1.4E+00 C	NO	5.1E+00	C	NO	BSL
	50-29-3	4,4'-DDT	5.3E-04 J	1.4E-03 J	MG/KG	CAA01-SS14-1108	3/8	0.004 - 0.0057	1.4E-03	N/A	N/A	1.7E+00 C*	NO	7.0E+00	C*	NO	BSL
	60-57-1	Dieldrin	4.6E-04 J	4.6E-04 J	MG/KG	CAA01-SS15-1108	1/8	0.004 - 0.0057	4.6E-04	N/A	N/A	3.0E-02 C	NO	1.1E-01	C	NO	BSL
	959-98-8	Endosulfan I	2.9E-04 J	2.9E-04 J	MG/KG	CAA01-SS13-1108	1/8	0.002 - 0.0028	2.9E-04	N/A	N/A	3.7E+01 N	NO	3.7E+02	N	NO	BSL
	7421-93-4	Endrin aldehyde	1.9E-03 J	1.9E-03 J	MG/KG	CAA01-SS13-1108	1/8	0.004 - 0.0057	1.9E-03	N/A	N/A	1.8E+00 N	NO	1.8E+01	N	NO	BSL
	7429-90-5	**Aluminum**	**6.2E+03**	**1.4E+04**	**MG/KG**	**CAA01-SS14-1108**	**8/8**	**13 - 32**	**1.4E+04**	**1.2E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04**	**NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	1.2E-01 L	6.3E+00 L	MG/KG	CAA01-SS15-1108	4/8	3.8 - 12	6.3E+00	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01	N	N/A	BBK
	7440-38-2	**Arsenic**	**1.9E+00**	**2.2E+01**	**MG/KG**	**CAA01-SS18P-1208**	**8/8**	**0.63 - 2**	**2.2E+01**	**6.4E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00**	**C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.4E+01	9.0E+01	MG/KG	CAA01-SS15-1108	8/8	13 - 32	9.0E+01	5.3E+01	YES	1.5E+03 N	NO	1.9E+04	NM	NO	BSL
	7440-41-7	Beryllium	1.5E-01 J	6.4E-01	MG/KG	CAA01-SS14-1108	8/8	0.32 - 0.81	6.4E-01	5.9E-01	YES	1.6E+01 N	NO	2.0E+02	N	NO	BSL
	7440-43-9	Cadmium	9.0E-02 J	2.0E+00	MG/KG	CAA01-SS14-1108	7/8	0.32 - 1	2.0E+00	1.5E+00	YES	7.0E+00 N	NO	8.0E+01	N	NO	BSL
	7440-70-2	Calcium	1.0E+03	1.2E+04	MG/KG	CAA01-SS15-1108	8/8	320 - 810	1.2E+04	2.3E+03	YES	N/A	NUT	N/A		NUT	NUT
	7440-47-3	**Chromium**	**7.4E+00**	**1.8E+01**	**MG/KG**	**CAA01-SS14-1108**	**8/8**	**0.63 - 2**	**1.8E+01**	**1.8E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00**	**C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	Cobalt	6.7E-01 J	4.6E+00 J	MG/KG	CAA01-SS15-1108	8/8	3.2 - 10	4.6E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01	N	N/A	BBK
	7440-50-8	Copper	2.3E+00	8.9E+01	MG/KG	CAA01-SS15-1108	8/8	1.6 - 4.1	8.9E+01	4.3E+00	YES	3.1E+02 N	NO	4.1E+03	N	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
	57-12-5	Cyanide	4.0E-01 L	5.1E-01 J	MG/KG	CAA01-SS15-1108	2/8	0.55 - 0.85	5.1E-01	N/A	N/A	1.6E+02 N	NO	2.0E+03	N	NO	BSL
	7439-89-6	**Iron**	**5.5E+03**	**3.2E+04**	**MG/KG**	**CAA01-SS15-1108**	**8/8**	**6.3 - 20**	**3.2E+04**	**2.0E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04**	**NM**	**NO**	**ASL-Res**
	7439-92-1	**Lead**	**8.3E+00**	**7.0E+02**	**MG/KG**	**CAA01-SS15-1108**	**8/8**	**0.63 - 2**	**7.0E+02**	**1.7E+01**	**YES**	**4.0E+02 N**	**N/A**	**8.0E+02**	**N**	**NO**	**NTX**
	7439-95-4	Magnesium	2.9E+02 J	1.2E+03	MG/KG	CAA01-SS14-1108	8/8	320 - 1000	1.2E+03	1.1E+03	YES	NA	NUT	N/A		NUT	NUT
	7439-96-5	**Manganese**	**1.7E+01**	**3.9E+02**	**MG/KG**	**CAA01-SS15-1108**	**8/8**	**0.95 - 3.1**	**3.9E+02**	**3.2E+02**	**YES**	**1.8E+02 N**	**YES**	**2.3E+03**	**N**	**NO**	**ASL-Res**
	7439-97-6	Mercury	1.1E-01 L	1.4E-01 J	MG/KG	CAA01-SS15-1108	3/8	0.11 - 0.18	1.4E-01	1.1E-01	YES	5.6E-01 N	NO	3.1E+01	N	NO	BSL
	7440-02-0	Nickel	1.6E+00 J	1.3E+01	MG/KG	CAA01-SS15-1108	8/8	2.5 - 8.2	1.3E+01	9.5E+00	YES	1.5E+02 N	NO	2.0E+03	N	NO	BSL
	7440-09-7	Potassium	2.7E+02 J	1.2E+03	MG/KG	CAA01-SS14-1108	8/8	320 - 810	1.2E+03	7.1E+02	YES	N/A	NUT	N/A		NUT	NUT
	7440-22-4	Silver	1.4E-01 J	3.0E-01 J	MG/KG	CAA01-SS13-1108	6/8	0.63 - 2	3.0E-01	2.1E+00	NO	3.9E+01 N	N/A	5.1E+02	N	N/A	BBK
	7440-62-2	Vanadium	1.1E+01	3.0E+01	MG/KG	CAA01-SS10-1108; CAA01-SS14-1108	8/8	3.2 - 10	3.0E+01	2.8E+01	YES	3.9E+01 N	NO	5.2E+02	N	NO	BSL
	7440-66-6	Zinc	6.8E+00	4.8E+02	MG/KG	CAA01-SS15-1108	8/8	3.8 - 9.8	4.8E+02	2.7E+01	YES	2.3E+03 N	NO	3.1E+04	NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Acenaphthene used as surrogate for Acenaphthylene.
RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.
RSL value for anthracene used as surrogate for phenanthrene.
RSL value for technical chlordane used as surrogate for gamma-chlordane.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for manganese (water) used as surrogate for manganese.
RSL value for mercury (inorganic salts) used as surrogate for mercury.
RSL value for endosulfan used as surrogate for endosulfan I.
RSL value for endrin used as surrogate for endrin aldehyde.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
S = Saturation
RSL = Regional Screening Levels
N/A = Not available or Not applicable
ND = Not detected
M = Concentration may exceed ceiling limit

TABLE 2.2a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 South - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)								
Benzo(a)anthracene	1 / 8	1.9E+00	CAA01-SS15-1108	1.5E-01	1E-06	NA	1E-05	NA
Benzo(a)pyrene	1 / 8	1.5E+00	CAA01-SS15-1108	1.5E-02	1E-06	NA	1E-04	NA
Benzo(b)fluoranthene	1 / 8	1.4E+00	CAA01-SS15-1108	1.5E-01	1E-06	NA	9E-06	NA
Dibenz(a,h)anthracene	1 / 8	2.7E-01 J	CAA01-SS15-1108	1.5E-02	1E-06	NA	2E-05	NA
Indeno(1,2,3-cd)pyrene	1 / 8	7.8E-01	CAA01-SS15-1108	1.5E-01	1E-06	NA	5E-06	NA
Metals (mg/kg)								
Aluminum	8 / 8	1.4E+04	CAA01-SS14-1108	7.7E+04	1	0.2	NA	Developmental, Neurological
Arsenic	8 / 8	2.2E+01	CAA01-SS18P-1208	3.9E-01	1E-06	NA	6E-05	NA
Chromium	8 / 8	1.8E+01	CAA01-SS14-1108	2.9E-01	1E-06	NA	6E-05	NA
Iron	8 / 8	3.2E+04	CAA01-SS15-1108	5.5E+04	1	0.6	NA	Gastrointestinal
Lead	8 / 8	7.0E+02	CAA01-SS15-1108	NA	NA	NA	NA	NA
Manganese	8 / 8	3.9E+02	CAA01-SS15-1108	1.8E+03	1	0.2	NA	CNS
Cumulative Corresponding Hazard Index[c]						**1**		
Cumulative Corresponding Cancer Risk[d]							**3E-04**	
							Total Developmental HI =	0.2
							Total Neurological/CNS HI =	0.4
							Total Gastrointestinal HI =	**0.6**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

K = Biased High

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.2b

Step 3 Surface Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 South - Surface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)									
Benzo(a)anthracene	1 / 8	1.4E+00	95% Cheb-m	5	1.5E-01	1E-06	NA	9E-06	NA
Benzo(a)pyrene	1 / 8	1.1E+00	95% Cheb-m	5	1.5E-02	1E-06	NA	7E-05	NA
Benzo(b)fluoranthene	1 / 8	1.0E+00	95% Cheb-m	5	1.5E-01	1E-06	NA	7E-06	NA
Dibenz(a,h)anthracene	1 / 8	2.6E-01	95% Stud-t	1, 2, 3, 4	1.5E-02	1E-06	NA	2E-05	NA
Indeno(1,2,3-cd)pyrene	1 / 8	4.3E-01	95% Stud-t	5	1.5E-01	1E-06	NA	3E-06	NA
Metals (mg/kg)									
Arsenic	8 / 8	1.3E+01	G-App	1, 3, 4	3.9E-01	1E-06	NA	3E-05	NA
Chromium	8 / 8	1.4E+01	95% Stud-t	1, 2, 3, 4	2.9E-01	1E-06	NA	5E-05	NA
Iron	8 / 8	2.1E+04	95% Stud-t	1, 2, 3, 4	5.5E+04	1	0.4	NA	Gastrointestinal
Cumulative Corresponding Hazard Index[c]							**0.4**		
Cumulative Corresponding Cancer Risk[d]								**2E-04**	
								Total Gastrointestinal HI =	**0.4**

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (M); 99% Kaplan-Meier Chebyshev (99% KM); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Kaplan-Meier (percentile Bootstrap) (95% KM-b); 95% Kaplan-Meier (BCA) UCL (95% KM-BCA); 95% Kaplan-Meier Chebyshev (95% KM); 95% Chebyshev (mean, std) UCL (95% Cheb-m); Approximate Gamma UCL (G-App); 95% Student's-T test UCL (95% Stud-t); 99% Chebyshev (Mean, Sd) UCL (99% Cheb-m); 97.5% Kaplan-Meier Chebyshev UCL (97.5% KM)

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Maximum detected concentration because sample set less than 5 samples.

(7) Maximum value used because calculated 95% UCL exceeds maximum concentration.

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity Value [5]	COPC Flag	Screening [3] Toxicity Value [6]	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Subsurface Soil	78-93-3	2-Butanone	2.0E-03 J	2.0E-03 J	MG/KG	CAA01-SB01-1108	1/10	0.010 - 0.014	2.0E-03	N/A	N/A	2.8E+03 NS	NO	2.0E+04 NMS	NO	BSL
AOC 1	100-42-5	Styrene	1.0E-03 J	2.0E-03 J	MG/KG	CAA01-SB02-1108	2/10	0.010 - 0.014	2.0E-03	N/A	N/A	6.3E+03 NS	NO	3.6E+03 NS	NO	BSL
North	108-88-3	Toluene	2.0E-03 J	2.0E-03 J	MG/KG	CAA01-SB02-1108	1/10	0.010 - 0.014	2.0E-03	N/A	N/A	5.0E+03 NS	NO	4.5E+03 NS	NO	BSL
	129-00-0	Pyrene	1.2E-01 J	1.2E-01 J	MG/KG	CAA01-SB05-1108	1/10	0.350 - 0.450	1.2E-01	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	72-54-8	4,4'-DDD	8.7E-04 J	5.2E-03	MG/KG	CAA01-SB08-1108	2/10	0.0035 - 0.0042	5.2E-03	N/A	N/A	2.0E+00 C	NO	7.2E+00 C	NO	BSL
	72-55-9	4,4'-DDE	2.3E-04 J	2.6E-02	MG/KG	CAA01-SB08-1108	4/10	0.0035 - 0.0042	2.6E-02	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	3.4E-03 J	1.5E-02	MG/KG	CAA01-SB08-1108	2/10	0.0035 - 0.0042	1.5E-02	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	7429-90-5	**Aluminum**	**5.4E+03**	**1.9E+04**	**MG/KG**	**CAA01-SB06-1108**	**10/10**	**12 - 20**	**1.9E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	9.0E-02 L	1.4E-01 L	MG/KG	CAA01-SB16-1108	2/10	3.7 - 8.3	1.4E-01	N/A	N/A	3.1E+00 N	NO	4.1E+01 N	NO	BSL
	7440-38-2	**Arsenic**	**1.1E+00**	**6.8E+00 L**	**MG/KG**	**CAA01-SB02P-1108**	**10/10**	**0.62 - 1.4**	**6.8E+00**	**5.5E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.5E+01	4.2E+01 K	MG/KG	CAA01-SB03-1108	10/10	12 - 20	4.2E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	1.7E-01 J	9.8E-01	MG/KG	CAA01-SB02P-1108	10/10	0.31 - 0.51	9.8E-01	5.2E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	3.0E-02 J	4.0E-02 J	MG/KG	CAA01-SB01-1108	2/10	0.31 - 0.69	4.0E-02	N/A	N/A	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	9.3E+01 J	1.6E+04	MG/KG	CAA01-SB01-1108	10/10	310 - 510	1.6E+04	2.4E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	4.8E+00	2.2E+01	MG/KG	CAA01-SB16-1108	10/10	0.62 - 1.4	2.2E+01	3.4E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	**Cobalt**	**7.6E-01 J**	**8.4E+00 J**	**MG/KG**	**CAA01-SB02-1108**	**10/10**	**3.1 - 6.9**	**8.4E+00**	**5.2E+00**	**YES**	**2.3E+00 N**	**YES**	**3.0E+01 N**	**NO**	**ASL-Res**
	7440-50-8	Copper	1.3E+00 J	1.1E+01	MG/KG	CAA01-SB03-1108	10/10	1.6 - 2.6	1.1E+01	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	57-12-5	Cyanide	1.0E+01	1.0E+01	MG/KG	CAA01-SB05-1108	1/10	0.5 - 0.6	1.0E+01	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7439-89-6	Iron	2.5E+03	2.9E+04	MG/KG	CAA01-SB16-1108	10/10	6.2 - 14	2.9E+04	3.2E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	6.1E+00	4.1E+01	MG/KG	CAA01-SB03-1108	10/10	0.62 - 2	4.1E+01	8.8E+00	YES	4.0E+02 N	N/A	8.0E+02 NL	NO	NTX
	7439-95-4	Magnesium	2.5E+02 J	1.2E+03	MG/KG	CAA01-SB08-1108	10/10	310 - 690	1.2E+03	1.1E+03	YES	NA	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	1.4E+01 L	1.1E+02	MG/KG	CAA01-SB08-1108	10/10	0.93 - 2.1	1.1E+02	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7440-02-0	Nickel	2.3E+00 J	9.7E+00 J	MG/KG	CAA01-SB02-1108	10/10	2.5 - 5.5	9.7E+00	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	1.8E+02 J	9.2E+02	MG/KG	CAA01-SB16-1108	10/10	310 - 510	9.2E+02	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	4.4E-01 J	4.4E-01 J	MG/KG	CAA01-SB03-1108	1/10	2.2 - 4.8	4.4E-01	6.4E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-22-4	Silver	9.0E-02 J	2.5E-01 J	MG/KG	CAA01-SB08-1108	4/10	0.62 - 1.4	2.5E-01	1.1E+00	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	1.6E+01 J	2.8E+01 J	MG/KG	CAA01-SB01-1108	5/10	310 - 510	2.8E+01	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	7.8E+00	3.6E+01	MG/KG	CAA01-SB06P-1108	10/10	3.1 - 6.9	3.6E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	6.5E+00	3.5E+01 K	MG/KG	CAA01-SB03-1108	10/10	3.7 - 6.1	3.5E+01	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

COPC = Chemical of Potential Concern

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

J = Estimated Value

K = Biased High

L = Biased Low

C = Carcinogenic

C* = where: N SL < 100X C SL

N = Noncarcinogenic

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.

The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

RSL value for Manganese (water) used as surrogate for manganese.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

S = Saturation
RSL = Regional Screening Levels
N/A = Not available or Not applicable
ND = Not detected
M = Concentration may exceed ceiling limit

TABLE 2.3a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 North - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	10 / 10	1.9E+04	CAA01-SB06-1108	7.7E+04	1	0.2	NA	Developmental, Neurological
Arsenic	10 / 10	6.8E+00 L	CAA01-SB02P-1108	3.9E-01	1E-06	NA	2E-05	NA
Cobalt	10 / 10	8.4E+00 J	CAA01-SB02-1108	2.3E+01	1	0.4	NA	Thyroid
Cumulative Corresponding Hazard Index[c]						**0.6**		
Cumulative Corresponding Cancer Risk[d]							**2E-05**	
						Total Developmental HI =		0.2
						Total Neurological/CNS HI =		0.2
						Total Thyroid HI =		0.4

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

L = Biased Low

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background Value [4]	COPC Flag	Screening [3] Toxicity Value [5]	COPC Flag	Screening [3] Toxicity Value [6]	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Subsurface Soil	78-93-3	2-Butanone	9.0E-03 J	9.0E-03 J	MG/KG	CAA01-SB18P-1208	1/8	0.010 - 0.014	9.0E-03	N/A	N/A	2.8E+03 N	NO	2.0E+04 NMS	NO	BSL
AOC 1	67-64-1	Acetone	4.8E-02	4.8E-02	MG/KG	CAA01-SB18-1208	1/8	0.010 - 0.014	4.8E-02	N/A	N/A	6.1E+03 N	NO	6.3E+04 NMS	NO	BSL
South	75-15-0	Carbon disulfide	2.0E-03 J	2.0E-03 J	MG/KG	CAA01-SB18-1208	1/8	0.010 - 0.014	2.0E-03	N/A	N/A	8.2E+01 NS	NO	3.7E+02 NS	NO	BSL
	50-32-8	**Benzo(a)pyrene**	**2.2E-01 J**	**2.2E-01 J**	**MG/KG**	**CAA01-SB17-1208**	**1/8**	**0.350 - 0.470**	**2.2E-01**	N/A	**N/A**	**1.5E-02 C**	**YES**	**2.1E-01 C**	**YES**	**ASL-Res, ASL-Ind**
	205-99-2	**Benzo(b)fluoranthene**	**2.9E-01 J**	**2.9E-01 J**	**MG/KG**	**CAA01-SB17-1208**	**1/8**	**0.350 - 0.470**	**2.9E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
	191-24-2	Benzo(g,h,i)perylene	3.5E-01 J	3.5E-01 J	MG/KG	CAA01-SB17-1208	1/8	0.350 - 0.470	3.5E-01	N/A	N/A	1.7E+01 N	NO	1.7E+03 N	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	2.1E-01 J	2.1E-01 J	MG/KG	CAA01-SB15-1108	1/8	0.350 - 0.470	2.1E-01	N/A	N/A	3.5E+01 C*	NO	1.2E+02 C	NO	BSL
	193-39-5	**Indeno(1,2,3-cd)pyrene**	**2.7E-01 J**	**2.7E-01 J**	**MG/KG**	**CAA01-SB17-1208**	**1/8**	**0.350 - 0.470**	**2.7E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
	72-54-8	4,4'-DDD	2.7E-04 J	4.8E-04 J	MG/KG	CAA01-SB17-1208	2/8	0.0035 - 0.0045	4.8E-04	N/A	N/A	2.0E+00 C	NO	7.2E+00 C	NO	BSL
	72-55-9	4,4'-DDE	2.2E-04 J	2.8E-04 J	MG/KG	CAA01-SB17-1208	3/8	0.0035 - 0.0045	2.8E-04	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	4.5E-04 J	4.8E-04 J	MG/KG	CAA01-SB13-1108	2/8	0.0035 - 0.0045	4.8E-04	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	7429-90-5	**Aluminum**	**4.2E+03**	**1.5E+04**	**MG/KG**	**CAA01-SB10-1108**	**8/8**	**14 - 25**	**1.5E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	**Antimony**	**3.2E-01 L**	**4.6E+01 L**	**MG/KG**	**CAA01-SB15-1108**	**6/8**	**4 - 12**	**4.6E+01**	N/A	N/A	**3.1E+00 N**	**YES**	**4.1E+01 N**	**YES**	**ASL-Res, ASL-Ind**
	7440-38-2	**Arsenic**	**1.5E+00**	**1.7E+01**	**MG/KG**	**CAA01-SB15-1108**	**8/8**	**0.68 - 2.1**	**1.7E+01**	**5.5E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	2.1E+01	6.2E+01	MG/KG	CAA01-SB17-1208	8/8	14 - 25	6.2E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.2E-01 J	5.9E-01 J	MG/KG	CAA01-SB13-1108	8/8	0.34 - 0.64	5.9E-01	5.2E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	1.5E-01 J	4.0E+00	MG/KG	CAA01-SB15-1108	5/8	0.34 - 1	4.0E+00	N/A	N/A	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	3.6E+02	2.7E+04	MG/KG	CAA01-SB15-1108	8/8	340 - 640	2.7E+04	2.4E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	4.0E+00	2.8E+01	MG/KG	CAA01-SB15-1108	8/8	0.68 - 2.1	2.8E+01	**3.4E+01**	**NO**	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	**Cobalt**	**1.3E+00 J**	**7.3E+00 J**	**MG/KG**	**CAA01-SB15-1108**	**8/8**	**3.4 - 10**	**7.3E+00**	**5.2E+00**	**YES**	**2.3E+00 N**	**YES**	**3.0E+01 N**	**NO**	**ASL-Res**
	7440-50-8	Copper	1.4E+00 J	1.1E+02	MG/KG	CAA01-SB15-1108	8/8	1.7 - 3.2	1.1E+02	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	57-12-5	Cyanide	3.0E-01 J	3.0E-01 J	MG/KG	CAA01-SB15-1108	1/8	0.5 - 0.7	3.0E-01	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7439-89-6	**Iron**	**2.3E+03**	**4.3E+04**	**MG/KG**	**CAA01-SB15-1108**	**8/8**	**6.8 - 21**	**4.3E+04**	**3.2E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**NO**	**ASL-Res**
	7439-92-1	**Lead**	**5.7E+00**	**3.4E+03**	**MG/KG**	**CAA01-SB15-1108**	**8/8**	**0.68 - 2.1**	**3.4E+03**	8.8E+00	YES	**4.0E+02 N**	**N/A**	**8.0E+02 N**	**YES**	**ASL-Res, ASL-Ind**
	7439-95-4	Magnesium	1.7E+02 J	1.5E+03	MG/KG	CAA01-SB14-1108	8/8	340 - 1000	1.5E+03	1.1E+03	YES	NA	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**4.6E+01**	**3.0E+02**	**MG/KG**	**CAA01-SB15-1108**	**8/8**	**1 - 3.1**	**3.0E+02**	1.8E+02	YES	**1.8E+02 N**	**YES**	**2.3E+03 N**	**NO**	**ASL-Res**
	7440-02-0	Nickel	1.9E+00 J	2.3E+01	MG/KG	CAA01-SB15-1108	8/8	2.7 - 8.4	2.3E+01	1.8E+01	YES	1.5E+02 N	NO	2.0E+03 N	NO	BSL
	7440-09-7	Potassium	1.3E+02 J	8.4E+02	MG/KG	CAA01-SB10-1108	8/8	340 - 640	8.4E+02	9.0E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-22-4	Silver	1.1E-01 J	2.6E-01 J	MG/KG	CAA01-SB19-1208	2/8	0.68 - 2.1	2.6E-01	1.1E+00	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	3.2E+01 J	4.3E+01 J	MG/KG	CAA01-SB19-1208	3/8	340 - 640	4.3E+01	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	6.2E+00	3.5E+01	MG/KG	CAA01-SB10-1108	8/8	3.4 - 10	3.5E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	5.2E+00	1.1E+03	MG/KG	CAA01-SB15-1108	8/8	4 - 7.6	1.1E+03	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.

COPC = Chemical of Potential Concern

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

J = Estimated Value

K = Biased High

L = Biased Low

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.

Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.

The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

RSL value for Manganese (water) used as surrogate for manganese.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
S = Saturation
RSL = Regional Screening Levels
N/A = Not available or Not applicable
ND = Not detected
M = Concentration may exceed ceiling limit

TABLE 2.4a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 South - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)								
Benzo(a)pyrene	1 / 8	2.2E-01 J	CAA01-SB17-1208	1.5E-02	1E-06	NA	1E-05	NA
Benzo(b)fluoranthene	1 / 8	2.9E-01 J	CAA01-SB17-1208	1.5E-01	1E-06	NA	2E-06	NA
Indeno(1,2,3-cd)pyrene	1 / 8	2.7E-01 J	CAA01-SB17-1208	1.5E-01	1E-06	NA	2E-06	NA
Metals (mg/kg)								
Aluminum	8 / 8	1.5E+04	CAA01-SB10-1108	7.7E+04	1	0.2	NA	Developmental, Neurological
Antimony	6 / 8	4.6E+01 L	CAA01-SB15-1108	3.1E+01	1	1	NA	Blood
Arsenic	8 / 8	1.7E+01	CAA01-SB15-1108	3.9E-01	1E-06	NA	4E-05	NA
Cobalt	10 / 10	7.3E+00 J	CAA01-SB15-1108	2.3E+01	1	0.3	NA	Thyroid
Iron	8 / 8	4.3E+04	CAA01-SB15-1108	5.5E+04	1	0.8	NA	Gastrointestinal
Lead	8 / 8	3.4E+03	CAA01-SB15-1108	NA	NA	NA	NA	NA
Manganese	8 / 8	3.0E+02	CAA01-SB15-1108	1.8E+03	1	0.2	NA	CNS
Cumulative Corresponding Hazard Index[c]						**3**		
Cumulative Corresponding Cancer Risk[d]							**6E-05**	

Total Developmental HI =	0.2
Total Neurological/CNS HI =	0.4
Total Thyroid HI =	0.3
Total Blood HI =	**1**
Total Gastrointestinal HI =	**0.8**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

K = Biased High

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.4b

Step 3 Subsurface Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 South - Subsurface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)									
Benzo(a)pyrene	1 / 8	2.2E-01	95% Stud-t	1, 2, 3, 4	1.5E-02	1E-06	NA	1E-05	NA
Benzo(b)fluoranthene	1 / 8	2.4E-01	95% Stud-t	1, 2, 3, 4	1.5E-01	1E-06	NA	2E-06	NA
Indeno(1,2,3-cd)pyrene	1 / 8	2.4E-01	95% Stud-t	1, 2, 3, 4	1.5E-01	1E-06	NA	2E-06	NA
Metals (mg/kg)									
Antimony	**6 / 8**	**4.6E+01**	**Max**	**5, 7**	**3.1E+01**	**1**	**1**	**NA**	**Blood**
Arsenic	8 / 8	1.1E+01	95% Stud-t	1, 2, 3, 4	3.9E-01	1E-06	NA	3E-05	NA
Iron	8 / 8	2.6E+04	95% Stud-t	5	5.5E+04	1	0.5	NA	Gastrointestinal
Cumulative Corresponding Hazard Index[c]							**2**		
Cumulative Corresponding Cancer Risk[d]								**5E-05**	
								Total Blood HI =	**1**
								Total Gastrointestinal HI =	0.5

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (M); 99% Kaplan-Meier Chebyshev (99% KM); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Kaplan-Meier (percentile Bootstrap) (95% KM-b); 95% Kaplan-Meier (BCA) UCL (95% KM-BCA); 95% Kaplan-Meier Chebyshev (95% KM); 95% Chebyshev (mean, std) UCL (95% Cheb-m); Approximate Gamma UCL (G-App); 95% Student's-T test UCL (95% Stud-t); 99% Chebyshev (Mean, Sd) UCL (99% Cheb-m); 97.5% Kaplan-Meier Chebyshev UCL (97.5% KM)

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Maximum detected concentration because sample set less than 5 samples.

(7) Maximum value used because calculated 95% UCL exceeds maximum concentration.

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Groundwater	67-64-1	Acetone	3.0E+00 J	3.0E+00 J	UG/L	CAA01-DW03-1108	1/3	10 - 10	3.0E+00	N/A	N/A	2.2E+03 N	NO	N/A	N/A	BSL
AOC 1	**7429-90-5**	**Aluminum**	**3.4E+03**	**1.4E+05**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**200 - 200**	**1.4E+05**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
North	7440-36-0	Antimony	2.9E+00 J	1.3E+01 L	UG/L	CAA01-DW03-1108	3/3	60 - 120	1.3E+01	1.9E+01	NO	1.5E+00 N	N/A	6.0E+00	N/A	BBK
	7440-38-2	**Arsenic**	**1.8E+01**	**7.3E+02**	**UG/L**	**CAA01-DW03-1108**	**2/3**	**10 - 20**	**7.3E+02**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	**Barium**	**7.3E+01 J**	**9.3E+02**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**200 - 200**	**9.3E+02**	**1.2E+02**	**YES**	**7.3E+02 N**	**YES**	**2.0E+03**	**NO**	**ASL-RSL**
	7440-41-7	**Beryllium**	**2.3E-01 J**	**1.2E+01**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**5 - 5**	**1.2E+01**	**2.5E+00**	**YES**	**7.3E+00 N**	**YES**	**4.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7440-43-9	Cadmium	1.7E+00 J	1.7E+00 J	UG/L	CAA01-DW03-1108	1/3	5 - 10	1.7E+00	6.1E-01	YES	1.8E+00 N	NO	5.0E+00	NO	BSL
	7440-70-2	Calcium	1.9E+05	1.7E+06	UG/L	CAA01-DW03-1108	3/3	5000 - 10000	1.7E+06	1.6E+05	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**6.2E+01**	**1.1E+03**	**UG/L**	**CAA01-DW03-1108**	**2/3**	**10 - 20**	**1.1E+03**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	**Cobalt**	**2.8E+00 J**	**9.1E+01 J**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**50 - 100**	**9.1E+01**	**2.1E+01**	**YES**	**1.1E+00 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-50-8	**Copper**	**1.5E+01 J**	**1.7E+02**	**UG/L**	**CAA01-DW03-1108**	**2/3**	**25 - 25**	**1.7E+02**	**1.2E+01**	**YES**	**1.5E+02 N**	**YES**	**1.3E+03**	**NO**	**ASL-RSL**
	7439-89-6	**Iron**	**8.4E+03**	**4.5E+05**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**100 - 200**	**4.5E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**1.1E+01**	**1.3E+02**	**UG/L**	**CAA01-DW03-1108**	**2/3**	**10 - 20**	**1.3E+02**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	4.9E+03 J	5.1E+04	UG/L	CAA01-DW03-1108	3/3	5000 - 10000	5.1E+04	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**1.4E+02**	**2.6E+03**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**15 - 30**	**2.6E+03**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-02-0	**Nickel**	**3.2E+02**	**3.2E+02**	**UG/L**	**CAA01-DW03-1108**	**1/3**	**40 - 80**	**3.2E+02**	**1.1E+01**	**YES**	**7.3E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-09-7	Potassium	3.9E+03 J	3.9E+04	UG/L	CAA01-DW03-1108	3/3	5000 - 5000	3.9E+04	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	**Selenium**	**6.4E+01 J**	**6.4E+01 J**	**UG/L**	**CAA01-DW03-1108**	**1/3**	**35 - 70**	**6.4E+01**	**N/A**	**N/A**	**1.8E+01 N**	**YES**	**5.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-22-4	Silver	4.4E-01 J	4.4E-01 J	UG/L	CAA01-DW01-1108	1/3	10 - 20	4.4E-01	N/A	N/A	1.8E+01 N	NO	N/A	N/A	BSL
	7440-23-5	Sodium	6.9E+03	2.3E+04	UG/L	CAA01-DW03-1108	3/3	5000 - 10000	2.3E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-62-2	**Vanadium**	**1.8E+01 J**	**8.2E+02**	**UG/L**	**CAA01-DW03-1108**	**3/3**	**50 - 100**	**8.2E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	6.3E+01	7.6E+02	UG/L	CAA01-DW03-1108	2/3	60 - 60	7.6E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concentrations were then compared to RSLs and MCLs.

[4] Background values from CAX groundwater background; values represent the 95% UTL.

[5] Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.
Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.
RSL value for Chromium VI (chromic acid mists) used as surrogate for chromium.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009).

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
ND = Not detected

TABLE 2.5a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 North - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	3 / 3	1.4E+05	CAA01-DW03-1108	3.7E+04	1	4	NA	Developmental, Neurological
Arsenic	2 / 3	7.3E+02	CAA01-DW03-1108	4.5E-02	1E-06	NA	2E-02	NA
Barium	3 / 3	9.3E+02	CAA01-DW03-1108	7.3E+03	1	0.1	NA	Kidney
Beryllium	3 / 3	1.2E+01	CAA01-DW03-1108	7.3E+01	1	0.2	NA	Gastrointestinal
Chromium	2 / 3	1.1E+03	CAA01-DW03-1108	4.3E-02	1E-06	NA	2E-02	NA
Cobalt	3 / 3	9.1E+01 J	CAA01-DW03-1108	1.1E+01	1	8	NA	Thyroid
Copper	2 / 3	1.7E+02	CAA01-DW03-1108	1.5E+03	1	0.1	NA	Gastrointestinal
Iron	3 / 3	4.5E+05	CAA01-DW03-1108	2.6E+04	1	17	NA	Gastrointestinal
Lead	2 / 3	1.3E+02	CAA01-DW03-1108	NA	NA	NA	NA	NA
Manganese	3 / 3	2.6E+03	CAA01-DW03-1108	8.8E+02	1	3	NA	CNS
Nickel	1 / 3	3.2E+02	CAA01-DW03-1108	7.3E+02	1	0.4	NA	Decreased Body Weight, Decreased Organ Weight
Selenium	1 / 3	6.4E+01 J	CAA01-DW03-1108	1.8E+02	1	0.4	NA	Whole Body
Vanadium	3 / 3	8.2E+02	CAA01-DW03-1108	1.8E+02	1	5	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**38**		
Cumulative Corresponding Cancer Risk[d]							**4E-02**	

Total Developmental HI =	**4**
Total CNS/Neurological HI =	**7**
Total Kidney HI =	**5**
Total Gastrointestinal HI =	**18**
Total Thyroid HI =	**8**
Total Decreased Organ Weight HI =	0.4
Total Whole Body HI =	**0.8**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

L = Biased Low

µg/L = micrograms per liter

NA = Not available/not applicable

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Groundwater AOC 1 South	67-64-1	Acetone	2.0E+00 J	2.0E+00 J	UG/L	CAA01-DW04P-1108	1/4	10 - 10	2.0E+00	N/A	N/A	2.2E+03 N	NO	N/A	N/A	BSL
	91-57-6	2-Methylnaphthalene	7.0E+00 J	7.0E+00 J	UG/L	CAA01-DW06-1208	1/4	9 - 10	7.0E+00	N/A	N/A	1.5E+01 N	NO	N/A	N/A	BSL
	7429-90-5	**Aluminum**	**1.5E+02 J**	**1.1E+05**	**UG/L**	**CAA01-DW04P-1108**	**4/4**	**200 - 200**	**1.1E+05**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-36-0	Antimony	1.1E+00 J	1.7E+00 J	UG/L	CAA01-DW06-1208	2/3	60 - 60	1.7E+00	1.9E+01	NO	1.5E+00 N	N/A	6.0E+00	N/A	BBK
	7440-38-2	**Arsenic**	**4.7E+01**	**4.7E+01**	**UG/L**	**CAA01-DW04P-1108**	**1/4**	**10 - 10**	**4.7E+01**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	3.4E+01 J	3.7E+02	UG/L	CAA01-DW04P-1108	4/4	200 - 200	3.7E+02	1.2E+02	YES	7.3E+02 N	NO	2.0E+03	NO	BSL
	7440-41-7	Beryllium	2.6E+00 J	2.6E+00 J	UG/L	CAA01-DW04P-1108	1/4	5 - 5	2.6E+00	2.5E+00	YES	7.3E+00 N	NO	4.0E+00	NO	BSL
	7440-43-9	Cadmium	1.7E+00 J	1.7E+00 J	UG/L	CAA01-DW04-1108	1/4	5 - 5	1.7E+00	6.1E-01	YES	1.8E+00 N	NO	5.0E+00	NO	BSL
	7440-70-2	Calcium	1.0E+05	1.8E+05	UG/L	CAA01-DW05-1208	4/4	5000 - 5000	1.8E+05	1.6E+05	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**5.8E-01 J**	**1.4E+02**	**UG/L**	**CAA01-DW04P-1108**	**3/4**	**10 - 10**	**1.4E+02**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	Cobalt	1.7E+01 J	1.7E+01 J	UG/L	CAA01-DW04P-1108	1/4	50 - 50	1.7E+01	2.1E+01	NO	1.1E+00 N	N/A	N/A	N/A	BBK
	7440-50-8	Copper	1.1E+00 J	4.9E+01	UG/L	CAA01-DW04P-1108	4/4	25 - 25	4.9E+01	1.2E+01	YES	1.5E+02 N	NO	1.3E+03	NO	BSL
	7439-89-6	**Iron**	**2.7E+03**	**1.1E+05**	**UG/L**	**CAA01-DW04P-1108**	**3/4**	**100 - 100**	**1.1E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**1.1E+00 J**	**9.4E+01**	**UG/L**	**CAA01-DW04P-1108**	**4/4**	**10 - 10**	**9.4E+01**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	1.9E+03 J	1.1E+04	UG/L	CAA01-DW04P-1108	4/4	5000 - 5000	1.1E+04	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**6.2E+00 J**	**8.1E+02**	**UG/L**	**CAA01-DW04P-1108**	**4/4**	**15 - 15**	**8.1E+02**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-97-6	Mercury	1.8E-01 J	1.8E-01 J	UG/L	CAA01-DW04-1108	1/4	0.2 - 0.2	1.8E-01	1.1E+01	NO	1.1E+00 N	N/A	2.0E+00	N/A	BBK
	7440-02-0	Nickel	4.5E-01 J	6.1E+01	UG/L	CAA01-DW04P-1108	4/4	40 - 40	6.1E+01	3.5E+03	NO	7.3E+01 N	N/A	N/A	N/A	BBK
	7440-09-7	Potassium	1.7E+03 J	6.7E+03	UG/L	CAA01-DW04P-1108	4/4	5000 - 5000	6.7E+03	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	1.0E+00 J	1.0E+00 J	UG/L	CAA01-DW04P-1108	1/4	35 - 35	1.0E+00	N/A	N/A	1.8E+01 N	NO	5.0E+01	NO	BSL
	7440-23-5	Sodium	5.8E+03	8.7E+03	UG/L	CAA01-DW05-1208	4/4	5000 - 5000	8.7E+03	9.9E+03	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	**Vanadium**	**1.4E+00 J**	**1.8E+02**	**UG/L**	**CAA01-DW04P-1108**	**3/4**	**50 - 50**	**1.8E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	3.1E+00 J	2.2E+02	UG/L	CAA01-DW04P-1108	4/4	60 - 60	2.2E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 1

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs and MCLs.

[4] Background values from CAX groundwater background; values represent the 95% UTL.

[5] Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.
Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.
RSL value for Chromium VI (chromic acid mists) used as surrogate for chromium.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009).

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not available or Not applicable
ND = Not detected
RSL = Regional Screening Levels

TABLE 2.6a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 1 South - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	4 / 4	1.1E+05	CAA01-DW04P-1108	3.7E+04	1	3	NA	Developmental, Neurological
Arsenic	1 / 4	4.7E+01	CAA01-DW04P-1108	4.5E-02	1E-06	NA	1E-03	NA
Chromium	3 / 4	1.4E+02	CAA01-DW04P-1108	4.3E-02	1E-06	NA	3E-03	NA
Iron	3 / 4	1.1E+05	CAA01-DW04P-1108	2.6E+04	1	4	NA	Gastrointestinal
Lead	4 / 4	9.4E+01	CAA01-DW04P-1108	NA	NA	NA	NA	NA
Manganese	4 / 4	8.1E+02	CAA01-DW04P-1108	8.8E+02	1	0.9	NA	CNS
Vanadium	3 / 4	1.8E+02	CAA01-DW04P-1108	1.8E+02	1	1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**9**		
Cumulative Corresponding Cancer Risk[d]							**4E-03**	

Total Developmental HI =	**3**
Total CNS/Neurological HI =	**4**
Total Gastrointestinal HI =	**4**
Total Kidney HI =	**1**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

µg/L = micrograms per liter

NA = Not available/not applicable

Attachment A.2—AOC 2

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil	72-55-9	4,4'-DDE	5.2E-01 J	5.2E-01 J	MG/KG	CAA02-A2-HA02-00-1098	1/6	0.0039 - 0.52	5.2E-01	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	6.4E-01 J	6.4E-01 J	MG/KG	CAA02-A2-HA02-00-1098	1/6	0.0039 - 0.64	6.4E-01	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	1024-57-3	Heptachlor epoxide	4.0E-03 J	4.0E-03 J	MG/KG	CAA02-A2-HA01-00D-1098	1/6	0.002 - 0.025	4.0E-03	N/A	N/A	5.3E-02 C*	NO	1.9E-01 C*	NO	BSL
	7429-90-5	Aluminum	1.9E+03	8.5E+03	MG/KG	CAA02-A2-DPB03-00-1098	6/6	1890 - 8500	8.5E+03	1.2E+04	NO	7.7E+03 N	N/A	9.9E+04 NM	N/A	BBK
	7440-36-0	Antimony	7.4E-01 L	7.4E-01 L	MG/KG	CAA02-A2-HA01-00D-1098	1/6	0.55 - 0.74	7.4E-01	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
	7440-38-2	**Arsenic**	**3.0E+00**	**2.0E+01**	**MG/KG**	**CAA02-A2-DPB03-00-1098**	**6/6**	**3 - 20**	**2.0E+01**	**6.4E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.8E+01 J	7.7E+01	MG/KG	CAA02-A2-HA01-00D-1098	6/6	18.4 - 77.2	7.7E+01	5.3E+01	YES	1.5E+03 N	NO	1.9E+04 NM	NO	BSL
	7440-41-7	Beryllium	1.4E-01 J	7.7E-01 J	MG/KG	CAA02-A2-DPB03-00-1098	6/6	0.14 - 0.77	7.7E-01	5.9E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-70-2	Calcium	9.9E+02	3.2E+03	MG/KG	CAA02-A2-HA01-00-1098	6/6	989 - 3190	3.2E+03	2.3E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**3.9E+00**	**3.9E+01**	**MG/KG**	**CAA02-A2-HA01-00D-1098**	**6/6**	**3.9 - 39**	**3.9E+01**	**1.8E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	Cobalt	2.4E+00 J	6.1E+00 J	MG/KG	CAA02-A2-DPB03-00-1098	5/6	1.5 - 6.1	6.1E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	2.2E+00 J	2.1E+01	MG/KG	CAA02-A2-HA01-00D-1098	6/6	2.2 - 20.5	2.1E+01	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	**Iron**	**3.2E+03**	**4.4E+04**	**MG/KG**	**CAA02-A2-DPB03-00-1098**	**6/6**	**3180 - 44000**	**4.4E+04**	**2.0E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**NO**	**ASL-Res**
	7439-92-1	Lead	8.0E+00	1.0E+02	MG/KG	CAA02-A2-HA01-00D-1098	6/6	8 - 104	1.0E+02	1.7E+01	YES	4.0E+02 N	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	2.7E+02	1.1E+03	MG/KG	CAA02-A2-DPB03-00-1098	6/6	269 - 1050	1.1E+03	1.1E+03	NO	N/A	N/A	N/A	N/A	BBK
	7439-96-5	Manganese	6.3E+01	2.4E+02	MG/KG	CAA02-A2-HA01-00-1098	6/6	62.7 - 240	2.4E+02	3.2E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	9.6E-01 J	1.8E+00	MG/KG	CAA02-A2-DPB01-00-1098	5/6	0.13 - 1.8	1.8E+00	1.1E-01	YES	2.3E+00 N	NO	3.1E+01 N	NO	BSL
	7440-02-0	Nickel	4.0E+00 J	1.3E+01	MG/KG	CAA02-A2-HA01-00D-1098	5/6	2.3 - 12.5	1.3E+01	9.5E+00	YES	1.5E+02 N	NO	2.0E+03 N	NO	BSL
	7440-09-7	Potassium	2.0E+02 J	1.3E+03	MG/KG	CAA02-A2-DPB03-00-1098	6/6	204 - 1320	1.3E+03	7.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	6.4E-01 K	7.1E-01 K	MG/KG	CAA02-A2-DPB04-00-1098	2/6	0.51 - 0.71	7.1E-01	5.1E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	1.1E+02 J	1.6E+02 J	MG/KG	CAA02-A2-HA02-00-1098	6/6	106 - 158	1.6E+02	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	**Vanadium**	**6.0E+00 J**	**4.2E+01**	**MG/KG**	**CAA02-A2-DPB03-00-1098**	**6/6**	**6 - 42.3**	**4.2E+01**	**2.8E+01**	**YES**	**3.9E+01 N**	**YES**	**5.2E+02**	**NO**	**ASL-Res**
	7440-66-6	Zinc	9.5E+00	9.7E+01	MG/KG	CAA02-A2-HA02-00-1098	6/6	9.5 - 96.9	9.7E+01	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background surface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* - Carcinogenic (where nc RSL<100 x ca RSL)
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

RSL value for Manganese (water) used as surrogate for manganese.

RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

TABLE 2.1a

Step 2 Surface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 2 - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Arsenic	6 / 6	2.0E+01	CAA02-A2-DPB03-00-1098	3.9E-01	1E-06	NA	5E-05	NA
Chromium	6 / 6	3.9E+01	CAA02-A2-HA01-00D-1098	2.9E-01	1E-06	NA	1E-04	NA
Iron	6 / 6	4.4E+04	CAA02-A2-DPB03-00-1098	5.5E+04	1	1	NA	Gastrointestinal
Vanadium	6 / 6	4.2E+01	CAA02-A2-DPB03-00-1098	3.9E+02	1	0.1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**1**		
Cumulative Corresponding Cancer Risk[d]							**2E-04**	
						Total Gastrointestinal HI =		**1**
						Total Kidney HI =		0.1

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

mg/kg = micrograms per kilogram

NA = Not available/not applicable

Generated by: D. Stannard

Checked by: R. Warren

Table 2.1b

Step 3 Surface Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 2 - Surface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)									
Arsenic	6 / 6	1.4E+01	95% Stud-t	1, 2, 3	3.9E-01	1E-06	NA	4E-05	NA
Chromium	6 / 6	2.9E+01	95% Stud-t	1, 2, 3	2.9E-01	1E-06	NA	1E-04	NA
Iron	6 / 6	3.2E+04	95% Stud-t	1, 2, 3	5.5E+04	1	0.6	NA	Gastrointestinal
Cumulative Corresponding Hazard Index[c]							**0.6**		
Cumulative Corresponding Cancer Risk[d]								**1E-04**	
								Total Gastrointestinal HI =	**0.6**

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

NA = Not available/not applicable

ProUCL, Version 4.00.05 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: 95% Student's-T test UCL (95% Stud-t)

Upper Confidence Limit (UCL) Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Test indicates data are gamma distributed.

(4) Distribution tests are inconclusive

(5) Max value used because 95% UCL greater than max.

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Subsurface Soil	67-64-1	Acetone	6.6E-02	6.6E-02	MG/KG	CAA02-A2-DPB01-03-1098	1/22	0.005 - 0.066	6.6E-02	N/A	N/A	6.1E+03 N	NO	6.3E+04 NMS	NO	BSL
	100-41-4	Ethylbenzene	7.0E-04 J	1.0E-02 J	MG/KG	CAA02-A2-TP05-F-1199	2/22	0.0007 - 0.014	1.0E-02	N/A	N/A	5.4E+00 C	NO	2.7E+01 C	NO	BSL
	100-42-5	Styrene	4.0E-03 J	4.0E-03 J	MG/KG	CAA02-A2-TP06-N-1199	1/22	0.004 - 0.014	4.0E-03	N/A	N/A	6.3E+02 NS	NO	3.6E+03 NS	NO	BSL
	1330-20-7	Xylene, total	1.0E-03 J	2.0E-03 J	MG/KG	CAA02-A2-TP05-N-1199 : CAA02-A2-TP05-ND-1199 : CAA02-A2-TP06-N-1199	3/22	0.001 - 0.014	2.0E-03	N/A	N/A	6.3E+01 NS	NO	2.7E+02 NS	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	4.2E-02 J	2.5E+00	MG/KG	CAA02-A2-TP03-F-1199	7/21	0.041 - 2.5	2.5E+00	N/A	N/A	3.5E+01 C*	NO	1.2E+02 C	NO	BSL
	84-74-2	Di-n-butylphthalate	4.6E-02 J	7.9E-02 J	MG/KG	CAA02-A2-TP04-F-1199	10/21	0.046 - 0.48	7.9E-02	N/A	N/A	6.1E+02 N	NO	6.2E+03 N	NO	BSL
	72-55-9	4,4'-DDE	5.4E-03 J	1.2E-01 J	MG/KG	CAA02-A2-HA02-01-1098	2/23	0.0037 - 0.12	1.2E-01	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	5.1E-02 J	5.1E-02 J	MG/KG	CAA02-A2-HA02-01-1098	1/23	0.0037 - 0.051	5.1E-02	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	11096-82-5	**Aroclor-1260**	**2.0E-01**	**3.1E-01**	**MG/KG**	**CAA02-A2-TP01-FD-1199**	**2/23**	**0.037 - 0.31**	**3.1E-01**	**N/A**	**N/A**	**2.2E-01 C**	**YES**	**7.4E-01 C**	**NO**	**ASL-Res**
	7429-90-5	**Aluminum**	**2.4E+03**	**1.6E+04 L**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**23/23**	**2370 - 16100**	**1.6E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	5.5E-01 L	1.3E+00 L	MG/KG	CAA02-A2-DPB02-03-1098	8/23	0.46 - 12.7	1.3E+00	ND	YES	3.1E+00 N	NO	4.1E+01 N	NO	BSL
	7440-38-2	**Arsenic**	**1.9E+00 J**	**3.7E+01**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**23/23**	**1.9 - 36.5**	**3.7E+01**	**5.5E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**SL-Res, ASL-Ind**
	7440-39-3	Barium	9.0E+00 J	6.6E+01	MG/KG	CAA02-A2-TP04-N-1199	23/23	9 - 66	6.6E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.5E-01 J	1.3E+00 J	MG/KG	CAA02-A2-TP03-N-1199	13/23	0.23 - 1.3	1.3E+00	5.2E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	**Cadmium**	**2.9E-01 J**	**1.2E+01**	**MG/KG**	**CAA02-A2-TP02-F-1199**	**7/23**	**0.04 - 12.3**	**1.2E+01**	**ND**	**YES**	**7.0E+00 N**	**YES**	**8.0E+01 N**	**NO**	**ASL-Res**
	7440-70-2	Calcium	1.8E+02 J	2.3E+05	MG/KG	CAA02-A2-DPB03-09-1098	22/23	183 - 229000	2.3E+05	2.4E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**9.2E+00**	**9.5E+01**	**MG/KG**	**CAA02-A2-TP02-F-1199**	**23/23**	**9.2 - 94.5**	**9.5E+01**	**3.4E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**SL-Res, ASL-Ind**
	7440-48-4	**Cobalt**	**2.3E+00 J**	**1.0E+01 J**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**22/23**	**1.7 - 10.2**	**1.0E+01**	**5.2E+00**	**YES**	**2.3E+00 N**	**YES**	**3.0E+01 N**	**NO**	**ASL-Res**
	7440-50-8	**Copper**	**1.6E+00 J**	**3.2E+02**	**MG/KG**	**CAA02-A2-TP02-F-1199**	**15/23**	**1 - 318**	**3.2E+02**	**3.2E+00**	**YES**	**3.1E+02 N**	**YES**	**4.1E+03 N**	**NO**	**ASL-Res**
	57-12-5	Cyanide	9.5E-01 J	9.5E-01 J	MG/KG	CAA02-A2-TP02-F-1199	1/23	0.02 - 0.95	9.5E-01	2.7E+00	NO	1.6E+02 N	N/A	2.0E+03 N	N/A	BBK
	7439-89-6	**Iron**	**9.6E+03**	**4.5E+04**	**MG/KG**	**CAA02-A2-DPB04-09-1098**	**23/23**	**9590 - 45300**	**4.5E+04**	**3.2E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**NO**	**ASL-Res**
	7439-92-1	Lead	2.1E+00	2.2E+02	MG/KG	CAA02-A2-TP02-F-1199	23/23	2.1 - 222	2.2E+02	8.8E+00	YES	4.0E+02 N	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	2.9E+02 J	3.4E+03	MG/KG	CAA02-A2-DPB03-09-1098	23/23	293 - 3390	3.4E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	7.1E+00	1.3E+02	MG/KG	CAA02-A2-DPB04-09-1098	23/23	7.1 - 134	1.3E+02	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	3.0E-02 J	1.2E+00	MG/KG	CAA02-A2-DPB01-03-1098	17/23	0.03 - 1.2	1.2E+00	1.4E-01	YES	2.3E+00 N	NO	3.1E+01 N	NO	BSL
	7440-02-0	Nickel	4.3E+00 J	2.4E+01	MG/KG	CAA02-A2-TP06-N-1199	21/23	2.6 - 24.4	2.4E+01	1.8E+01	YES	1.5E+02 N	NO	2.0E+03 N	NO	BSL
	7440-09-7	Potassium	3.1E+02 J	4.7E+03	MG/KG	CAA02-A2-DPB03-09-1098	23/23	312 - 4720	4.7E+03	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	6.8E-01 K	6.8E-01 K	MG/KG	CAA02-A2-HA01-02-1098	1/23	0.46 - 1.1	6.8E-01	6.4E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-22-4	Silver	1.1E+01	2.0E+01	MG/KG	CAA02-A2-TP02-F-1199	6/23	0.21 - 19.7	2.0E+01	1.1E+00	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	1.0E+02 J	1.5E+03	MG/KG	CAA02-A2-DPB01-15-1098	10/23	18 - 1460	1.5E+03	8.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7440-28-0	Thallium	8.4E-01 L	8.4E-01 L	MG/KG	CAA02-A2-TP02-N-1199	1/23	0.24 - 2.1	8.4E-01	ND	YES	N/A	N/A	N/A	N/A	NTX
	7440-62-2	**Vanadium**	**8.2E+00 J**	**6.9E+01 J**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**23/23**	**8.2 - 69.2**	**6.9E+01**	**4.8E+01**	**YES**	**3.9E+01 N**	**YES**	**5.2E+02**	**NO**	**ASL-Res**
	7440-66-6	Zinc	7.3E+00	1.3E+02	MG/KG	CAA02-A2-TP02-F-1199	13/23	7.3 - 127	1.3E+02	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown subsurface soil background samples; values represent the 95% UTL.

COPC = Chemical of Potential Concern

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

J = Estimated Value

K = Biased High

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason:
Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason:
Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

L = Biased Low
C = Carcinogenic
C* - Carcinogenic (where nc RSL<100 x ca RSL)
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected
S = Concentration may exceed stauration concentration

TABLE 2.2a

Step 2 Subsurface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 2 - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Pesticides/PCBs (mg/kg)								
Aroclor-1260	2 / 23	3.1E-01	CAA02-A2-TP01-FD-1199	2.2E-01	1E-06	NA	1E-06	NA
Metals (mg/kg)								
Aluminum	23 / 23	1.6E+04 L	CAA02-A2-TP03-N-1199	7.7E+04	1	0.2	NA	Developmental, Neurological
Arsenic	23 / 23	3.7E+01	CAA02-A2-TP03-N-1199	3.9E-01	1E-06	NA	9E-05	NA
Cadmium	7 / 23	1.2E+01	CAA02-A2-TP02-F-1199	7.0E+01	1	0.2	NA	Kidney
Chromium	23 / 23	9.5E+01	CAA02-A2-TP02-F-1199	2.9E-01	1E-06	NA	3E-04	NA
Cobalt	22 / 23	1.0E+01 J	CAA02-A2-TP03-N-1199	2.3E+01	1	0.4	NA	Thyroid
Copper	15 / 23	3.2E+02	CAA02-A2-TP02-F-1199	3.1E+03	1	0.1	NA	Gastrointestinal
Iron	23 / 23	4.5E+04	CAA02-A2-DPB04-09-1098	5.5E+04	1	0.8	NA	Gastrointestinal
Vanadium	23 / 23	6.9E+01 J	CAA02-A2-TP03-N-1199	3.9E+02	1	0.2	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**1.9**		
Cumulative Corresponding Cancer Risk[d]							**4E-04**	

Total Kidney HI =	0.4
Total Thyroid HI =	0.4
Total Gastrointestinal HI =	**0.9**
Total Developmental HI =	0.2
Total Neurological HI =	0.2

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

L = Biased Low

mg/kg = micrograms per kilogram

NA = Not available/not applicable

Generated by: D. Stannard

Checked by: R. Warren

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Subsurface Soil	67-64-1	Acetone	6.6E-02	6.6E-02	MG/KG	CAA02-A2-DPB01-03-1098	1/22	0.005 - 0.066	6.6E-02	N/A	N/A	6.1E+03 N	NO	6.3E+04 NMS	NO	BSL
	100-41-4	Ethylbenzene	7.0E-04 J	1.0E-02 J	MG/KG	CAA02-A2-TP05-F-1199	2/22	0.0007 - 0.014	1.0E-02	N/A	N/A	5.4E+00 C	NO	2.7E+01 C	NO	BSL
	100-42-5	Styrene	4.0E-03 J	4.0E-03 J	MG/KG	CAA02-A2-TP06-N-1199	1/22	0.004 - 0.014	4.0E-03	N/A	N/A	6.3E+02 NS	NO	3.6E+03 NS	NO	BSL
	1330-20-7	Xylene, total	1.0E-03 J	2.0E-03 J	MG/KG	CAA02-A2-TP05-N-1199 : CAA02-A2-TP05-ND-1199 : CAA02-A2-TP06-N-1199	3/22	0.001 - 0.014	2.0E-03	N/A	N/A	6.3E+01 NS	NO	2.7E+02 NS	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	4.2E-02 J	2.5E+00	MG/KG	CAA02-A2-TP03-F-1199	7/21	0.041 - 2.5	2.5E+00	N/A	N/A	3.5E+01 C*	NO	1.2E+02 C	NO	BSL
	84-74-2	Di-n-butylphthalate	4.6E-02 J	7.9E-02 J	MG/KG	CAA02-A2-TP04-F-1199	10/21	0.046 - 0.48	7.9E-02	N/A	N/A	6.1E+02 N	NO	6.2E+03 N	NO	BSL
	72-55-9	4,4'-DDE	5.4E-03 J	1.2E-01 J	MG/KG	CAA02-A2-HA02-01-1098	2/23	0.0037 - 0.12	1.2E-01	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	5.1E-02 J	5.1E-02 J	MG/KG	CAA02-A2-HA02-01-1098	1/23	0.0037 - 0.051	5.1E-02	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	11096-82-5	**Aroclor-1260**	**2.0E-01**	**3.1E-01**	**MG/KG**	**CAA02-A2-TP01-FD-1199**	**2/23**	**0.037 - 0.31**	**3.1E-01**	**N/A**	**N/A**	**2.2E-01 C**	**YES**	**7.4E-01 C**	**NO**	**ASL-Res**
	7429-90-5	**Aluminum**	**2.4E+03**	**1.6E+04 L**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**23/23**	**2370 - 16100**	**1.6E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	5.5E-01 L	1.3E+00 L	MG/KG	CAA02-A2-DPB02-03-1098	8/23	0.46 - 12.7	1.3E+00	ND	YES	3.1E+00 N	NO	4.1E+01 N	NO	BSL
	7440-38-2	**Arsenic**	**1.9E+00 J**	**3.7E+01**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**23/23**	**1.9 - 36.5**	**3.7E+01**	**5.5E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**SL-Res, ASL-Ind**
	7440-39-3	Barium	9.0E+00 J	6.6E+01	MG/KG	CAA02-A2-TP04-N-1199	23/23	9 - 66	6.6E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.5E-01 J	1.3E+00 J	MG/KG	CAA02-A2-TP03-N-1199	13/23	0.23 - 1.3	1.3E+00	5.2E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	**Cadmium**	**2.9E-01 J**	**1.2E+01**	**MG/KG**	**CAA02-A2-TP02-F-1199**	**7/23**	**0.04 - 12.3**	**1.2E+01**	**ND**	**YES**	**7.0E+00 N**	**YES**	**8.0E+01 N**	**NO**	**ASL-Res**
	7440-70-2	Calcium	1.8E+02 J	2.3E+05	MG/KG	CAA02-A2-DPB03-09-1098	22/23	183 - 229000	2.3E+05	2.4E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**9.2E+00**	**9.5E+01**	**MG/KG**	**CAA02-A2-TP02-F-1199**	**23/23**	**9.2 - 94.5**	**9.5E+01**	**3.4E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**SL-Res, ASL-Ind**
	7440-48-4	**Cobalt**	**2.3E+00 J**	**1.0E+01 J**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**22/23**	**1.7 - 10.2**	**1.0E+01**	**5.2E+00**	**YES**	**2.3E+00 N**	**YES**	**3.0E+01 N**	**NO**	**ASL-Res**
	7440-50-8	**Copper**	**1.6E+00 J**	**3.2E+02**	**MG/KG**	**CAA02-A2-TP02-F-1199**	**15/23**	**1 - 318**	**3.2E+02**	**3.2E+00**	**YES**	**3.1E+02 N**	**YES**	**4.1E+03 N**	**NO**	**ASL-Res**
	57-12-5	Cyanide	9.5E-01 J	9.5E-01 J	MG/KG	CAA02-A2-TP02-F-1199	1/23	0.02 - 0.95	9.5E-01	2.7E+00	NO	1.6E+02 N	N/A	2.0E+03 N	N/A	BBK
	7439-89-6	**Iron**	**9.6E+03**	**4.5E+04**	**MG/KG**	**CAA02-A2-DPB04-09-1098**	**23/23**	**9590 - 45300**	**4.5E+04**	**3.2E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**NO**	**ASL-Res**
	7439-92-1	Lead	2.1E+00	2.2E+02	MG/KG	CAA02-A2-TP02-F-1199	23/23	2.1 - 222	2.2E+02	8.8E+00	YES	4.0E+02 N	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	2.9E+02 J	3.4E+03	MG/KG	CAA02-A2-DPB03-09-1098	23/23	293 - 3390	3.4E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	7.1E+00	1.3E+02	MG/KG	CAA02-A2-DPB04-09-1098	23/23	7.1 - 134	1.3E+02	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	3.0E-02 J	1.2E+00	MG/KG	CAA02-A2-DPB01-03-1098	17/23	0.03 - 1.2	1.2E+00	1.4E-01	YES	2.3E+00 N	NO	3.1E+01 N	NO	BSL
	7440-02-0	Nickel	4.3E+00 J	2.4E+01	MG/KG	CAA02-A2-TP06-N-1199	21/23	2.6 - 24.4	2.4E+01	1.8E+01	YES	1.5E+02 N	NO	2.0E+03 N	NO	BSL
	7440-09-7	Potassium	3.1E+02 J	4.7E+03	MG/KG	CAA02-A2-DPB03-09-1098	23/23	312 - 4720	4.7E+03	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	6.8E-01 K	6.8E-01 K	MG/KG	CAA02-A2-HA01-02-1098	1/23	0.46 - 1.1	6.8E-01	6.4E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-22-4	Silver	1.1E+01	2.0E+01	MG/KG	CAA02-A2-TP02-F-1199	6/23	0.21 - 19.7	2.0E+01	1.1E+00	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	1.0E+02 J	1.5E+03	MG/KG	CAA02-A2-DPB01-15-1098	10/23	18 - 1460	1.5E+03	8.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7440-28-0	Thallium	8.4E-01 L	8.4E-01 L	MG/KG	CAA02-A2-TP02-N-1199	1/23	0.24 - 2.1	8.4E-01	ND	YES	N/A	N/A	N/A	N/A	NTX
	7440-62-2	**Vanadium**	**8.2E+00 J**	**6.9E+01 J**	**MG/KG**	**CAA02-A2-TP03-N-1199**	**23/23**	**8.2 - 69.2**	**6.9E+01**	**4.8E+01**	**YES**	**3.9E+01 N**	**YES**	**5.2E+02**	**NO**	**ASL-Res**
	7440-66-6	Zinc	7.3E+00	1.3E+02	MG/KG	CAA02-A2-TP02-F-1199	13/23	7.3 - 127	1.3E+02	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown subsurface soil background samples; values represent the 95% UTL.

COPC = Chemical of Potential Concern

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

J = Estimated Value

K = Biased High

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason:
Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason:
Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

L = Biased Low
C = Carcinogenic
C* - Carcinogenic (where nc RSL<100 x ca RSL)
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected
S = Concentration may exceed stauration concentration

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [4] Toxicity [5] Value	COPC Flag	Screening [4] MCL [6] Value	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Groundwater	84-66-2	Diethylphthalate	1.0E+00 J	1.0E+00 J	UG/L	CAA02-A2DPW01-1098	1/4	10 - 10	1.0E+00	N/A	N/A	2.9E+03 N	NO	N/A	N/A	BSL
	7429-90-5	**Aluminum**	**2.2E+03**	**1.9E+05**	**UG/L**	**CAA02-A2DPW01-1098**	**4/4**	**14 - 14**	**1.9E+05**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-36-0	Antimony	7.7E+00	1.4E+01	UG/L	CAA02-A2DPW01-1098	3/4	2.4 - 2.4	1.4E+01	1.9E+01	NO	1.5E+00 N	N/A	6.0E+00	N/A	BBK
	7440-38-2	**Arsenic**	**5.1E+00 J**	**4.3E+02**	**UG/L**	**CAA02-A2DPW04-1098**	**4/4**	**1.8 - 1.8**	**4.3E+02**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	3.8E+01 J	5.1E+02	UG/L	CAA02-A2DPW01-1098	4/4	7.4 - 7.4	5.1E+02	1.2E+02	YES	7.3E+02 N	NO	2.0E+03	NO	BSL
	7440-41-7	**Beryllium**	**3.3E+00 J**	**9.6E+00**	**UG/L**	**CAA02-A2DPW01-1098**	**3/4**	**0.2 - 0.2**	**9.6E+00**	**2.5E+00**	**YES**	**7.3E+00 N**	**YES**	**4.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7440-43-9	**Cadmium**	**5.9E+00**	**8.7E+00**	**UG/L**	**CAA02-A2DPW01-1098**	**3/4**	**4.3 - 4.3**	**8.7E+00**	**6.1E-01**	**YES**	**1.8E+00 N**	**YES**	**5.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7440-70-2	Calcium	1.6E+05	2.5E+06	UG/L	CAA02-A2DPW01-1098	4/4	21.3 - 21.3	2.5E+06	1.6E+05	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**1.0E+01**	**6.0E+02**	**UG/L**	**CAA02-A2DPW01-1098**	**4/4**	**3.3 - 3.3**	**6.0E+02**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	**Cobalt**	**3.2E+01 J**	**7.4E+01**	**UG/L**	**CAA02-A2DPW01-1098**	**3/4**	**6.3 - 6.3**	**7.4E+01**	**2.1E+01**	**YES**	**1.1E+00 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-50-8	Copper	3.7E+01	1.0E+02	UG/L	CAA02-A2DPW01-1098	3/4	4.1 - 4.1	1.0E+02	1.2E+01	YES	1.5E+02 N	NO	1.3E+03	NO	BSL
	7439-89-6	**Iron**	**5.6E+03**	**3.8E+05**	**UG/L**	**CAA02-A2DPW01-1098**	**4/4**	**13 - 13**	**3.8E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**3.6E+01**	**9.5E+01**	**UG/L**	**CAA02-A2DPW01-1098**	**3/4**	**1 - 1**	**9.5E+01**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	2.3E+03	5.2E+04	UG/L	CAA02-A2DPW01-1098	4/4	32.9 - 32.9	5.2E+04	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**3.8E+01**	**1.4E+03**	**UG/L**	**CAA02-A2DPW01-1098**	**4/4**	**1 - 1**	**1.4E+03**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-02-0	**Nickel**	**7.1E+01**	**1.7E+02**	**UG/L**	**CAA02-A2DPW01-1098**	**3/4**	**9.6 - 9.6**	**1.7E+02**	**1.1E+01**	**YES**	**7.3E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-09-7	Potassium	1.8E+03 J	5.5E+04	UG/L	CAA02-A2DPW01-1098	4/4	84.2 - 84.2	5.5E+04	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	2.9E+00 K	4.6E+00 K	UG/L	CAA02-A2DPW02-1098	2/4	2.2 - 2.2	4.6E+00	N/A	N/A	1.8E+01 N	NO	5.0E+01	NO	BSL
	7440-23-5	Sodium	7.3E+03	1.9E+04	UG/L	CAA02-A2DPW01-1098	4/4	28.1 - 28.1	1.9E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-28-0	Thallium	1.2E+00 L	2.0E+00 J	UG/L	CAA02-A2DPW02-1098	2/4	1.2 - 1.2	2.0E+00	N/A	N/A	N/A	N/A	N/A	N/A	NTX
	7440-62-2	**Vanadium**	**6.1E+00 J**	**4.2E+02**	**UG/L**	**CAA02-A2DPW01-1098**	**4/4**	**3.2 - 3.2**	**4.2E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	1.4E+01 J	6.7E+02	UG/L	CAA02-A2DPW01-1098	4/4	6.8 - 6.8	6.7E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values from CAX groundwater background; values represent the 95% UTL.

[4] Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009).

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
N/A = Not available or Not applicable

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 2

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [4] Toxicity [5] Value	COPC Flag	Screening [4] MCL [6] Value	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

Deletion Reason:
Above Maximum Contaminant Level (ASL-MCL)
Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

TABLE 2.3a

Step 2 Groundwater - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 2 - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	4 / 4	1.9E+05	CAA02-A2DPW01-1098	3.7E+04	1	5	NA	Developmental, Neurological
Arsenic	4 / 4	4.3E+02	CAA02-A2DPW04-1098	4.5E-02	1E-06	NA	1E-02	NA
Beryllium	3 / 4	9.6E+00	CAA02-A2DPW01-1098	7.3E+01	1	0.1	NA	Gastrointestinal
Cadmium	3 / 4	8.7E+00	CAA02-A2DPW01-1098	1.8E+01	1	0.5	NA	Kidney
Chromium	4 / 4	6.0E+02	CAA02-A2DPW01-1098	4.3E-02	1E-06	NA	1E-02	NA
Cobalt	3 / 4	7.4E+01	CAA02-A2DPW01-1098	1.1E+01	1	7	NA	Thyroid
Iron	4 / 4	3.8E+05	CAA02-A2DPW01-1098	2.6E+04	1	15	NA	Gastrointestinal
Lead	3 / 4	9.5E+01	CAA02-A2DPW01-1098	NA	NA	NA	NA	NA
Manganese	4 / 4	1.4E+03	CAA02-A2DPW01-1098	8.8E+02	1	2	NA	CNS
Nickel	3 / 4	1.7E+02	CAA02-A2DPW01-1098	7.3E+02	1	0.2	NA	Decreased Body Weight, Decreased Organ Weight
Vanadium	4 / 4	4.2E+02	CAA02-A2DPW01-1098	1.8E+02	1	2	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**31**		
Cumulative Corresponding Cancer Risk[d]							**2E-02**	

Total CNS/Neurological HI =	**7**
Total Developmental HI =	**5**
Total Thyroid HI =	**7**
Total Gastrointestinal HI =	**15**
Total Decreased Organ Weight HI =	0.2
Total Decreased Body Weight HI =	0.2
Total Kidney HI =	**3**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

NA = Not available/not applicable

Attachment A.3—AOC 6

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil	121-14-2	2,4-Dinitrotoluene	4.2E-01	4.2E-01	MG/KG	CAA06-SS05-1008	1/5	0.1 - 0.51	4.2E-01	N/A	N/A	1.6E+00 C*	NO	5.5E+00 C	NO	BSL
AOC 6	**56-55-3**	**Benzo(a)anthracene**	**2.3E-01 J**	**2.3E-01 J**	**MG/KG**	**CAA06-SS05-1008; CAA06-SS06P-1008**	**2/5**	**0.38 - 0.51**	**2.3E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
ASP	**50-32-8**	**Benzo(a)pyrene**	**2.2E-01 J**	**2.7E-01 J**	**MG/KG**	**CAA06-SS05-1008**	**2/5**	**0.38 - 0.51**	**2.7E-01**	N/A	**N/A**	**1.5E-02 C**	**YES**	**2.1E-01 C**	**YES**	**ASL-Res, ASL-Ind**
	205-99-2	**Benzo(b)fluoranthene**	**2.0E-01 J**	**2.3E-01 J**	**MG/KG**	**CAA06-SS05-1008**	**2/5**	**0.38 - 0.51**	**2.3E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
	191-24-2	Benzo(g,h,i)perylene	1.3E-01 J	1.6E-01 J	MG/KG	CAA06-SS05-1008	2/5	0.38 - 0.51	1.6E-01	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.7E-01 J	1.9E-01 J	MG/KG	CAA06-SS05-1008	2/5	0.38 - 0.51	1.9E-01	N/A	N/A	1.5E+00 C	NO	2.1E+01 C	NO	BSL
	218-01-9	Chrysene	4.4E-01	4.4E-01	MG/KG	CAA06-SS05-1008 CAA06-SS06P-1008	2/5	0.38 - 0.51	4.4E-01	N/A	N/A	1.5E+01 C	NO	2.1E+02 C	NO	BSL
	206-44-0	Fluoranthene	2.4E-01 J	3.2E-01 J	MG/KG	CAA06-SS05-1008	2/5	0.38 - 0.51	3.2E-01	N/A	N/A	2.3E+02 N	NO	2.2E+03 N	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	1.0E-01 J	1.0E-01 J	MG/KG	CAA06-SS05-1008	1/5	0.38 - 0.51	1.0E-01	N/A	N/A	1.5E-01 C	NO	2.1E+00 C	NO	BSL
	85-01-8	Phenanthrene	2.1E-01 J	2.8E-01 J	MG/KG	CAA06-SS05-1008	2/5	0.38 - 0.51	2.8E-01	N/A	N/A	1.7E+03 N	NO	1.7E+04 NM	NO	BSL
	129-00-0	Pyrene	1.7E-01 J	7.9E-01	MG/KG	CAA06-SS05-1008	3/5	0.38 - 0.51	7.9E-01	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	1.2E-01	2.1E+00	MG/KG	CAA06-SS10-1108	2/5	0.1 - 0.1	2.1E+00	N/A	N/A	2.2E+02 N	NO	2.7E+03 N	NO	BSL
	99-65-0	1,3-Dinitrobenzene	1.0E-01	1.0E-01	MG/KG	CAA06-SS05-1008	1/5	0.1 - 0.1	1.0E-01	N/A	N/A	6.1E-01 N	NO	6.2E+00 N	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	1.5E-01	2.9E+00	MG/KG	CAA06-SS06P-1008	3/5	0.1 - 0.1	2.9E+00	N/A	N/A	3.6E+00 N	NO	4.2E+01 N	NO	BSL
	35572-78-2	2-Amino-4,6-dinitrotoluene	1.2E-01	1.2E-01	MG/KG	CAA06-SS06-1008	1/5	0.1 - 0.1	1.2E-01	N/A	N/A	1.5E+01 N	NO	2.0E+02 N	NO	BSL
	2691-41-0	HMX	2.0E+01	2.0E+01	MG/KG	CAA06-SS10-1108	1/5	0.2 - 0.2	2.0E+01	N/A	N/A	3.8E+02 N	NO	4.9E+03 N	NO	BSL
	7429-90-5	Aluminum	4.4E+03	1.1E+04	MG/KG	CAA06-SS05-1008; CAA06-SS12-1108	5/5	16 - 21	1.1E+04	1.2E+04	NO	7.7E+03 N	N/A	9.9E+04 NM	N/A	BBK
	7440-36-0	Antimony	6.0E-02 L	7.3E-01 L	MG/KG	CAA06-SS10-1108	2/5	4.8 - 6.3	7.3E-01	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
	7440-38-2	Arsenic	1.8E+00 L	3.9E+00 L	MG/KG	CAA06-SS12-1108	5/5	0.8 - 1	3.9E+00	6.4E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	1.6E+01 K	3.1E+01	MG/KG	CAA06-SS05-1008	5/5	16 - 21	3.1E+01	5.3E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	1.7E-01 J	4.2E-01 J	MG/KG	CAA06-SS05-1008	5/5	0.4 - 0.53	4.2E-01	5.9E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	8.0E-02 J	9.0E-02 J	MG/KG	CAA06-SS05-1008	2/5	0.4 - 0.53	9.0E-02	1.5E+00	NO	7.0E+00 N	N/A	8.0E+01 N	N/A	BBK
	7440-70-2	Calcium	1.9E+02 J	1.8E+03	MG/KG	CAA06-SS10-1108	5/5	400 - 530	1.8E+03	2.3E+03	NO	NA	N/A	N/A	N/A	BBK
	7440-47-3	Chromium	5.0E+00	1.4E+01	MG/KG	CAA06-SS12-1108	5/5	0.8 - 1	1.4E+01	1.8E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	7.8E-01 J	2.4E+00 J	MG/KG	CAA06-SS12-1108	5/5	4 - 5.3	2.4E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	5.3E+00	3.2E+01	MG/KG	CAA06-SS06-1008	2/5	2 - 2.6	3.2E+01	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	4.0E+03	9.8E+03	MG/KG	CAA06-SS12-1108	5/5	8 - 10	9.8E+03	2.0E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	1.8E+01	7.4E+01 J	MG/KG	CAA06-SS06P-1008	5/5	0.8 - 1	7.4E+01	1.7E+01	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	3.1E+02 J	7.7E+02	MG/KG	CAA06-SS05-1008	5/5	400 - 530	7.7E+02	1.1E+03	NO	N/A	N/A	N/A	N/A	BBK
	7439-96-5	Manganese	1.9E+01 L	5.7E+01 L	MG/KG	CAA06-SS12-1108	5/5	1.2 - 1.6	5.7E+01	3.2E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	6.0E-02 L	1.8E-01	MG/KG	CAA06-SS06P-1008	4/5	0.11 - 0.16	1.8E-01	1.1E-01	YES	2.3E+00 N	NO	3.1E+01 N	NO	BSL
	7440-02-0	Nickel	2.6E+00 J	7.0E+00	MG/KG	CAA06-SS05-1008	5/5	3.2 - 4.2	7.0E+00	9.5E+00	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	2.4E+02 J	5.0E+02 J	MG/KG	CAA06-SS05-1008	5/5	400 - 530	5.0E+02	7.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7782-49-2	Selenium	3.9E-01 J	4.4E-01 J	MG/KG	CAA06-SS12-1108	2/5	2.8 - 3.7	4.4E-01	5.1E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	3.4E+01 J	5.1E+01 J	MG/KG	CAA06-SS05-1008	2/5	400 - 530	5.1E+01	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	1.1E+01	2.2E+01	MG/KG	CAA06-SS12-1108	5/5	4 - 5.3	2.2E+01	2.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	9.8E+00 K	3.0E+01	MG/KG	CAA06-SS05-1008	5/5	4.8 - 6.3	3.0E+01	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background surface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for pyrene used as surrogate for benzo(g,h,i)perylene.
RSL value for anthracene used as surrogate for phenanthrene.
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

[7] Rationale Codes

Selection Reason:	Above Residential Soil Screening Levels (ASL-Res)
	Above Industrial Soil Screening Levels (ASL-Ind)
Deletion Reason:	Below Background (BBK)
	Below Screening Level (BSL)
	No Toxicity Information (NTX)
	Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** = where N RSL < 10X C RSL, therefore, N RSL used
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

TABLE 2.1a

Step 2 Surface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 Ammonia Settling Pit Area - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)								
Benzo(a)anthracene	2 / 5	2.3E-01 J	CAA06-SS05-1008 : CAA06-SS06P-1008	1.5E-01	1E-06	NA	2E-06	NA
Benzo(a)pyrene	2 / 5	2.7E-01 J	CAA06-SS05-1008	1.5E-02	1E-06	NA	2E-05	NA
Benzo(b)fluoranthene	2 / 5	2.3E-01 J	CAA06-SS05-1008	1.5E-01	1E-06	NA	2E-06	NA
Cumulative Corresponding Hazard Index[c]						**NA**		
Cumulative Corresponding Cancer Risk[d]							**2E-05**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil	**7429-90-5**	**Aluminum**	**5.0E+03**	**1.3E+04**	**MG/KG**	**CAA06-SS19P-1108**	**6/6**	**13 - 19**	**1.3E+04**	**1.2E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
AOC 6	7440-36-0	Antimony	5.0E-02 L	5.0E-01 L	MG/KG	CAA06-SS15-1108	4/6	3.9 - 5.8	5.0E-01	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
DSA	7440-38-2	Arsenic	2.4E+00	4.9E+00	MG/KG	CAA06-SS19P-1108	6/6	0.65 - 0.96	4.9E+00	6.4E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	2.8E+01	4.6E+01	MG/KG	CAA06-SS18-1108	6/6	13 - 19	4.6E+01	5.3E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.8E-01 J	5.3E-01	MG/KG	CAA06-SS14-1108	6/6	0.32 - 0.48	5.3E-01	5.9E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	2.0E-02 J	1.7E-01 J	MG/KG	CAA06-SS18-1108	6/6	0.32 - 0.48	1.7E-01	1.5E+00	NO	7.0E+00 N	N/A	8.0E+01 N	N/A	BBK
	7440-70-2	Calcium	5.6E+02	8.1E+03	MG/KG	CAA06-SS16-1108	6/6	320 - 480	8.1E+03	2.3E+03	YES	NA	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	6.3E+00	1.7E+01	MG/KG	CAA06-SS19P-1108	6/6	0.65 - 0.96	1.7E+01	1.8E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	1.1E+00 J	2.0E+00 J	MG/KG	CAA06-SS16-1108	6/6	3.2 - 4.8	2.0E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	4.2E+00	8.2E+00	MG/KG	CAA06-SS15-1108	6/6	1.6 - 2.4	8.2E+00	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	5.4E+03	1.1E+04	MG/KG	CAA06-SS16-1108	6/6	6.5 - 9.6	1.1E+04	2.0E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	2.3E+01	1.3E+02	MG/KG	CAA06-SS15-1108	6/6	0.65 - 0.96	1.3E+02	1.7E+01	YES	4.0E+02 NL	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	4.1E+02	1.1E+03	MG/KG	CAA06-SS15-1108	6/6	320 - 480	1.1E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	5.6E+01	9.5E+01	MG/KG	CAA06-SS14-1108	6/6	0.97 - 1.4	9.5E+01	3.2E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	6.0E-02 J	6.0E-02 J	MG/KG	CAA06-SS14-1108; CAA06-SS15-1108; CAA06-SS19-1108; CAA06-SS19P-1108	3/6	0.1 - 0.13	6.0E-02	1.1E-01	NO	2.3E+00 N	NO	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	2.9E+00 J	5.9E+00	MG/KG	CAA06-SS16-1108	6/6	2.6 - 3.8	5.9E+00	9.5E+00	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	3.6E+02 J	8.7E+02	MG/KG	CAA06-SS19P-1108	6/6	320 - 480	8.7E+02	7.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	3.1E-01 J	3.7E-01 J	MG/KG	CAA06-SS19P-1108	2/6	2.3 - 3.4	3.7E-01	5.1E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-22-4	Silver	6.2E-01 J	6.2E-01 J	MG/KG	CAA06-SS14-1108	1/6	0.65 - 0.96	6.2E-01	2.1E+00	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	2.3E+01 J	8.1E+01 J	MG/KG	CAA06-SS16-1108	6/6	320 - 480	8.1E+01	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-28-0	Thallium	6.0E-02 J	7.0E-02 J	MG/KG	CAA06-SS14-1108	2/6	1.6 - 2.4	7.0E-02	ND	YES	7.8E-02 N	NO	1.0E+00 N	NO	BSL
	7440-62-2	Vanadium	8.9E+00	2.3E+01	MG/KG	CAA06-SS19P-1108	6/6	3.2 - 4.8	2.3E+01	2.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	2.2E+01	1.0E+02	MG/KG	CAA06-SS18-1108	6/6	3.9 - 5.8	1.0E+02	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background surface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10-6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** = where N RSL < 10X C RSL, therefore, N RSL used
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

TABLE 2.2a

Step 2 Surface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 1918 Drum Storage Area - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	6 / 6	1.3E+04	CAA06-SS19P-1108	7.7E+04	1	0.2	NA	Developmental, Neurological
Cumulative Corresponding Hazard Index[c]						**0.2**		
Cumulative Corresponding Cancer Risk[d]							**0E+00**	
							Total Developmental HI =	0.2
							Total Neurological HI =	0.2

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil	**121-14-2**	**2,4-Dinitrotoluene**	**1.4E-01 J**	**6.3E+00 L**	**MG/KG**	**CAA06-SS01-1008**	**3/7**	**0.099 - 0.46**	**6.3E+00**	**N/A**	**N/A**	**1.6E+00 C***	**YES**	**5.5E+00 C**	**YES**	**ASL-Res, ASL-Ind**
AOC 6	100-52-7	Benzaldehyde	3.2E-01 J	3.2E-01 J	MG/KG	CAA06-SS01-1008	1/7	0.37 - 0.46	3.2E-01	N/A	N/A	7.8E+02 NS	NO	1.0E+04 NMS	NO	BSL
TNT	56-55-3	Benzo(a)anthracene	1.1E-01 J	1.1E-01 J	MG/KG	CAA06-SS01-1008	1/7	0.37 - 0.46	1.1E-01	N/A	N/A	1.5E-01 C	NO	2.1E+00 C	NO	BSL
	218-01-9	Chrysene	1.5E-01 J	1.5E-01 J	MG/KG	CAA06-SS01-1008	1/7	0.37 - 0.46	1.5E-01	N/A	N/A	1.5E+01 C	NO	2.1E+02 C	NO	BSL
	206-44-0	Fluoranthene	3.0E-01 J	3.0E-01 J	MG/KG	CAA06-SS01-1008	1/7	0.37 - 0.46	3.0E-01	N/A	N/A	2.3E+02 N	NO	2.2E+03 N	NO	BSL
	129-00-0	Pyrene	5.8E-01 J	5.8E-01 J	MG/KG	CAA06-SS01-1008	1/7	0.37 - 0.46	5.8E-01	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	2.5E-01	1.1E+00	MG/KG	CAA06-SS13-1108	3/7	0.099 - 0.1	1.1E+00	N/A	N/A	2.2E+02 N	NO	2.7E+03 N	NO	BSL
	99-65-0	**1,3-Dinitrobenzene**	**8.4E-02 J**	**7.3E-01 J**	**MG/KG**	**CAA06-SS01-1008**	**3/7**	**0.099 - 0.1**	**7.3E-01**	**N/A**	**N/A**	**6.1E-01 N**	**YES**	**6.2E+00 N**	**NO**	**ASL-Res**
	118-96-7	**2,4,6-Trinitrotoluene**	**1.7E-01**	**4.5E+03**	**MG/KG**	**CAA06-SS01-1008**	**5/7**	**0.099 - 20**	**4.5E+03**	**N/A**	**N/A**	**3.6E+00 N**	**YES**	**4.2E+01 N**	**YES**	**ASL-Res, ASL-Ind**
	35572-78-2	**2-Amino-4,6-dinitrotoluene**	**1.4E+00 J**	**1.6E+01 J**	**MG/KG**	**CAA06-SS02-1008**	**3/7**	**0.099 - 0.1**	**1.6E+01**	**N/A**	**N/A**	**1.5E+01 N**	**YES**	**2.0E+02 N**	**NO**	**ASL-Res**
	88-72-2	**2-Nitrotoluene**	**4.8E+01 J**	**4.8E+01 J**	**MG/KG**	**CAA06-SS02-1008**	**1/6**	**0.2 - 0.2**	**4.8E+01**	**N/A**	**N/A**	**2.9E+00 C***	**YES**	**1.3E+01 C***	**YES**	**ASL-Res, ASL-Ind**
	618-87-1	**3,5-Dinitroaniline**	**8.9E-01**	**8.9E-01**	**MG/KG**	**CAA06-SS13-1108**	**1/7**	**0.099 - 0.1**	**8.9E-01**	**N/A**	**N/A**	**6.1E-01 N**	**YES**	**6.2E+00 N**	**NO**	**ASL-Res**
	19406-51-0	**4-Amino-2,6-dinitrotoluene**	**1.4E+00**	**1.7E+01**	**MG/KG**	**CAA06-SS02-1008**	**3/6**	**0.099 - 0.1**	**1.7E+01**	**N/A**	**N/A**	**1.5E+01 N**	**YES**	**1.9E+02 N**	**NO**	**ASL-Res**
	121-82-4	RDX	2.2E-01	2.2E-01	MG/KG	CAA06-SS01-1008	1/7	0.2 - 0.2	2.2E-01	**N/A**	N/A	5.5E+00 C*	NO	2.4E+01 C	NO	BSL
	479-45-8	Tetryl	6.4E-01	6.4E-01	MG/KG	CAA06-SS01-1008	1/7	0.2 - 0.2	6.4E-01	**N/A**	N/A	2.4E+01 N	NO	2.5E+02 N	NO	BSL
	7429-90-5	**Aluminum**	**5.2E+03**	**2.5E+04**	**MG/KG**	**CAA06-SS03-1008**	**7/7**	**13 - 25**	**2.5E+04**	**1.2E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	1.0E-01 L	2.1E-01 L	MG/KG	CAA06-SS03-1008	2/7	4 - 14	2.1E-01	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
	7440-38-2	**Arsenic**	**2.7E+00 L**	**1.2E+01 J**	**MG/KG**	**CAA06-SS03-1008**	**7/7**	**0.67 - 2.3**	**1.2E+01**	**6.4E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.8E+01 K	4.6E+01	MG/KG	CAA06-SS03-1008	7/7	13 - 25	4.6E+01	5.3E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.6E-01 J	5.5E-01	MG/KG	CAA06-SS03-1008	7/7	0.33 - 0.62	5.5E-01	5.9E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	4.0E-02 J	1.2E-01 J	MG/KG	CAA06-SS03-1008	4/7	0.33 - 1.1	1.2E-01	1.5E+00	NO	7.0E+00 N	N/A	8.0E+01 N	N/A	BBK
	7440-70-2	Calcium	3.0E+02 J	2.3E+03	MG/KG	CAA06-SS01-1008	7/7	330 - 620	2.3E+03	2.3E+03	NO	NA	N/A	N/A	N/A	BBK
	7440-47-3	**Chromium**	**6.1E+00**	**3.5E+01 L**	**MG/KG**	**CAA06-SS03-1008**	**7/7**	**0.67 - 2.3**	**3.5E+01**	**1.8E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	Cobalt	1.3E+00 J	3.6E+00 J	MG/KG	CAA06-SS01-1008	7/7	3.3 - 11	3.6E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	3.6E+00	9.8E+00	MG/KG	CAA06-SS01-1008	4/7	1.7 - 3.1	9.8E+00	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	57-12-5	Cyanide	1.3E+00	1.3E+00	MG/KG	CAA06-SS13-1108	1/7	0.5 - 0.7	1.3E+00	ND	YES	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7439-89-6	**Iron**	**4.8E+03**	**3.7E+04 J**	**MG/KG**	**CAA06-SS01-1008**	**7/7**	**6.7 - 12**	**3.7E+04**	**2.0E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**NO**	**ASL-Res**
	7439-92-1	**Lead**	**9.9E+00 J**	**5.8E+02 J**	**MG/KG**	**CAA06-SS01-1008**	**7/7**	**0.67 - 2.3**	**5.8E+02**	**1.7E+01**	**YES**	**4.0E+02 NL**	**YES**	**8.0E+02 N**	**NO**	**ASL-Res**
	7439-95-4	Magnesium	4.1E+02	1.3E+03	MG/KG	CAA06-SS03-1008	7/7	330 - 1100	1.3E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	2.5E+01	1.8E+02	MG/KG	CAA06-SS01-1008	7/7	1 - 3.4	1.8E+02	3.2E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	5.0E-02 L	1.3E-01 L	MG/KG	CAA06-SS01-1008	4/7	0.11 - 0.15	1.3E-01	1.1E-01	YES	2.3E+00 N	NO	3.1E+01 N	NO	BSL
	7440-02-0	Nickel	3.7E+00	1.0E+01	MG/KG	CAA06-SS01-1008	7/7	2.7 - 9.1	1.0E+01	9.5E+00	YES	1.5E+02 N	NO	2.0E+03 N	NO	BSL
	7440-09-7	Potassium	2.5E+02 J	1.5E+03	MG/KG	CAA06-SS03-1008	7/7	330 - 620	1.5E+03	7.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	3.8E-01 J	2.0E+00 J	MG/KG	CAA06-SS01-1008	4/7	2.3 - 8	2.0E+00	5.1E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	2.9E+01 J	6.8E+01 J	MG/KG	CAA06-SS01-1008	4/7	330 - 620	6.8E+01	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-28-0	Thallium	1.8E-01 J	1.8E-01 J	MG/KG	CAA06-SS03-1008	1/7	1.7 - 5.7	1.8E-01	ND	YES	N/A	N/A	N/A	N/A	NTX
	7440-62-2	**Vanadium**	**1.0E+01**	**5.0E+01**	**MG/KG**	**CAA06-SS03-1008**	**7/7**	**3.3 - 11**	**5.0E+01**	**2.8E+01**	**YES**	**3.9E+01 N**	**YES**	**5.2E+02 N**	**NO**	**ASL-Res**
	7440-66-6	Zinc	1.2E+01 K	1.8E+02	MG/KG	CAA06-SS03-1008	7/7	4 - 7.4	1.8E+02	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background Value [4]	COPC Flag	Screening [3] Toxicity Value [5]	COPC Flag	Screening [3] Toxicity Value [6]	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background surface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for 1,3-Dinitrobenzene uses as a surrogate for 3,5-Dinitroaniline.
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C SL
C** = where N RSL < 10X C SL, therefore, N SL used
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

Generated by: D. Stannard

TABLE 2.3a

Step 3 Surface Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Explosives (mg/kg)								
2,4-Dinitrotoluene	3 / 7	6.3E+00 L	CAA06-SS01-1008	1.6E+00	1E-06	NA	4E-06	NA
1,3-Dinitrobenzene	3 / 7	7.3E-01 J	CAA06-SS01-1008	6.1E+00	1	0.1	NA	Spleen
2,4,6-Trinitrotoluene	5 / 7	4.5E+03	CAA06-SS01-1008	1.9E+01	1E-06	NA	2E-04	NA
2-Amino-4,6-dinitrotoluene	3 / 7	1.6E+01 J	CAA06-SS02-1008	1.5E+02	1	0.1	NA	Neurotoxicity
2-Nitrotoluene	1 / 6	4.8E+01 J	CAA06-SS02-1008	2.9E+00	1E-06	NA	2E-05	NA
3,5-Dinitroaniline	1 / 7	8.9E-01	CAA06-SS13-1108	6.1E+00	1	0.1	NA	Spleen
4-Amino-2,6-dinitrotoluene	3 / 6	1.7E+01	CAA06-SS02-1008	1.5E+02	1	0.1	NA	Neurotoxicity
Metals (mg/kg)								
Aluminum	7 / 7	2.5E+04	CAA06-SS03-1008	7.7E+04	1	0.3	NA	Developmental, Neurological
Arsenic	7 / 7	1.2E+01 J	CAA06-SS03-1008	3.9E-01	1E-06	NA	3E-05	NA
Chromium	7 / 7	3.5E+01 L	CAA06-SS03-1008	2.9E-01	1E-06	NA	1E-04	NA
Iron	7 / 7	3.7E+04 J	CAA06-SS01-1008	5.5E+04	1	0.7	NA	Gastrointestinal
Lead	7 / 7	5.8E+02 J	CAA06-SS01-1008	NA	NA	NA	NA	NA
Vanadium	7 / 7	5.0E+01	CAA06-SS03-1008	3.9E+02	1	0.1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**2**		
Cumulative Corresponding Cancer Risk[d]							**4E-04**	

Total Spleen HI =	0.3
Total Developmental HI =	0.3
Total Neurological HI =	0.5
Total Gastrointestinal HI =	**0.7**
Total Kidney HI =	0.1

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

L = Biased Low

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.3b

Step 3 Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Surface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Explosives (mg/kg)									
2,4-Dinitrotoluene	3 / 7	3.0E+00	95% KM-t	1, 2	1.6E+00	1E-06	NA	2E-06	NA
2,4,6-Trinitrotoluene	5 / 7	3.6E+03	95% KM	1, 3, 4	1.9E+01	1E-06	NA	2E-04	NA
2-Nitrotoluene	1 / 6	4.8E+01	Max	7	2.9E+00	1E-06	NA	2E-05	NA
Metals (mg/kg)									
Arsenic	7 / 7	7.9E+00	95% Stud-t	2	3.9E-01	1E-06	NA	2E-05	NA
Chromium	7 / 7	2.2E+01	95% Stud-t	1, 2, 3, 4	2.9E-01	1E-06	NA	8E-05	NA
Iron	7 / 7	2.6E+04	G-App	1, 3, 4	5.5E+04	1	0.5	NA	Gastrointestinal
Cumulative Corresponding Hazard Index[c]							**0.5**		
Cumulative Corresponding Cancer Risk[d]								**3E-04**	
								Total Gastrointestinal HI =	0.5

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (Max); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Kaplan-Meier Chebyshev (95% KM); Approximate Gamma UCL (G-App); 95% Student's-T test UCL (95% Stud-t).

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Max value used because 95% UCL greater than max.

(7) Maximum detected concentration because only 1 detected sample.

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
ASP	99-35-4	1,3,5-Trinitrobenzene	4.1E-02 J	4.1E-02 J	MG/KG	CAA06-SB06P-1008	1/5	0.099 - 0.1	4.1E-02	N/A	N/A	2.2E+02 N	NO	2.7E+03 N	NO	BSL
Subsurface Soil	118-96-7	2,4,6-Trinitrotoluene	1.0E-01	1.0E-01	MG/KG	CAA06-SB06-1008; CAA06-SB10-1108	2/5	0.099 - 0.1	1.0E-01	N/A	N/A	3.6E+00 N	NO	4.2E+01 N	NO	BSL
	7429-90-5	**Aluminum**	**5.1E+03**	**1.6E+04**	**MG/KG**	**CAA06-SB10-1108**	**5/5**	**15 - 20**	**1.6E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	7.0E-02 L	7.0E-02 L	MG/KG	CAA06-SB06-1008	1/5	4.4 - 6.1	7.0E-02	ND	YES	3.1E+00 N	NO	4.1E+01 N	NO	BSL
	7440-38-2	Arsenic	1.8E+00 L	4.9E+00 L	MG/KG	CAA06-SB10-1108	5/5	0.74 - 1	4.9E+00	5.5E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	1.5E+01 K	2.5E+01	MG/KG	CAA06-SB06-1008	5/5	15 - 20	2.5E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.4E-01 J	4.2E-01 J	MG/KG	CAA06-SB06-1008	5/5	0.37 - 0.51	4.2E-01	5.2E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	2.0E-02 J	4.0E-02 J	MG/KG	CAA06-SB06-1008	2/5	0.37 - 0.51	4.0E-02	ND	YES	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	8.3E+01 J	7.2E+02	MG/KG	CAA06-SB10-1108	4/5	370 - 510	7.2E+02	2.4E+03	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	Chromium	5.7E+00	2.6E+01	MG/KG	CAA06-SB10-1108	5/5	0.74 - 1	2.6E+01	3.4E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	9.9E-01 J	3.5E+00 J	MG/KG	CAA06-SB10-1108	5/5	3.7 - 5.1	3.5E+00	5.2E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	2.5E+00	3.0E+01 J	MG/KG	CAA06-SB06-1008	2/5	1.8 - 2.5	3.0E+01	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	4.1E+03	1.5E+04	MG/KG	CAA06-SB10-1108	5/5	7.4 - 10	1.5E+04	3.2E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	5.6E+00	9.2E+01 J	MG/KG	CAA06-SB06-1008	5/5	0.74 - 1	9.2E+01	8.8E+00	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	3.7E+02 J	9.4E+02	MG/KG	CAA06-SB10-1108	5/5	370 - 510	9.4E+02	1.1E+03	NO	N/A	N/A	N/A	N/A	BBK
	7439-96-5	Manganese	1.7E+01 L	3.9E+01	MG/KG	CAA06-SB05-1008; CAA06-SB06-1008	5/5	1.1 - 1.5	3.9E+01	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	7.0E-02 L	7.0E-02 L	MG/KG	CAA06-SB06-1008	1/5	0.084 - 0.12	7.0E-02	1.4E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	2.8E+00 J	7.6E+00	MG/KG	CAA06-SB06-1008	5/5	3 - 4	7.6E+00	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	2.2E+02 J	8.7E+02 J	MG/KG	CAA06-SB10-1108	5/5	370 - 510	8.7E+02	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	4.2E-01 J	4.8E-01 J	MG/KG	CAA06-SB10-1108	3/5	2.6 - 3.5	4.8E-01	6.4E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	2.4E+01 J	4.8E+01 J	MG/KG	CAA06-SB10-1108	3/5	370 - 510	4.8E+01	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	9.2E+00	3.0E+01	MG/KG	CAA06-SB10-1108	5/5	3.7 - 5.1	3.0E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	9.7E+00 K	5.6E+01 J	MG/KG	CAA06-SB06-1008	5/5	4.4 - 6.1	5.6E+01	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown subsurface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** = where N RSL < 10X c RSL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

TABLE 2.4a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 Ammonia Settling Pit Area - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	5 / 5	1.6E+04	CAA06-SB10-1108	7.7E+04	1E+00	0.2	NA	Developmental, Neurological
Cumulative Corresponding Hazard Index[c]						**0.2**		
Cumulative Corresponding Cancer Risk[d]							**NA**	
						Total Developmental HI =		0.2
						Total Neurological HI =		0.2

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
DSA	**7429-90-5**	**Aluminum**	**5.8E+03**	**1.3E+04**	**MG/KG**	**CAA06-SB16-1108**	**6/6**	**11 - 18**	**1.3E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
Subsurface Soil	7440-36-0	Antimony	1.0E-01 L	1.6E-01 L	MG/KG	CAA06-SB15-1108;CAA06-SB16-1108; CAA06-SB17-1108	5/6	3.3 - 5.4	1.6E-01	ND	YES	3.1E+00 N	NO	4.1E+01 N	NO	BSL
	7440-38-2	Arsenic	2.2E+00	5.0E+00	MG/KG	CAA06-SB15-1108	6/6	0.56 - 0.9	5.0E+00	5.5E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	2.7E+01	4.5E+01	MG/KG	CAA06-SB14-1108	6/6	11 - 18	4.5E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.3E-01 J	4.8E-01	MG/KG	CAA06-SB15-1108	6/6	0.28 - 0.45	4.8E-01	5.2E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	3.0E-02 J	8.0E-02 J	MG/KG	CAA06-SB18-1108	4/6	0.28 - 0.45	8.0E-02	ND	YES	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	6.3E+02	1.3E+04	MG/KG	CAA06-SB16-1108	6/6	280 - 450	1.3E+04	2.4E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	8.4E+00	2.0E+01	MG/KG	CAA06-SB15-1108	6/6	0.56 - 0.9	2.0E+01	3.4E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	9.5E-01 J	2.4E+00 J	MG/KG	CAA06-SB15-1108	6/6	2.8 - 4.5	2.4E+00	5.2E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	2.8E+00	6.2E+00	MG/KG	CAA06-SB19-1108	6/6	1.4 - 2.2	6.2E+00	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	5.8E+03	1.3E+04	MG/KG	CAA06-SB15-1108	6/6	5.6 - 9	1.3E+04	3.2E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	7.6E+00	6.0E+01	MG/KG	CAA06-SB15-1108	6/6	0.56 - 0.9	6.0E+01	8.8E+00	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	4.3E+02	1.2E+03	MG/KG	CAA06-SB19-1108	6/6	280 - 450	1.2E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	2.9E+01	1.0E+02	MG/KG	CAA06-SB14-1108	6/6	0.84 - 1.4	1.0E+02	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	4.0E-02 J	4.0E-02 J	MG/KG	CAA06-SB19-1108	1/6	0.1 - 0.12	4.0E-02	1.4E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	2.8E+00 J	6.7E+00	MG/KG	CAA06-SB19P-1108	6/6	2.2 - 3.6	6.7E+00	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	3.4E+02 J	1.0E+03	MG/KG	CAA06-SB15-1108	6/6	280 - 450	1.0E+03	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	3.3E-01 J	3.3E-01 J	MG/KG	CAA06-SB17-1108	1/6	2 - 3.2	3.3E-01	6.4E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	2.1E+01 J	1.2E+02 J	MG/KG	CAA06-SB16-1108	6/6	280 - 450	1.2E+02	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-28-0	**Thallium**	**8.0E-02 J**	**8.0E-02 J**	**MG/KG**	**CAA06-SB16-1108**	**1/6**	**1.4 - 2.2**	**8.0E-02**	**ND**	**YES**	**7.8E-02 N**	**YES**	**1.0E+00 N**	**NO**	**ASL-Res**
	7440-62-2	Vanadium	1.2E+01	2.5E+01	MG/KG	CAA06-SB15-1108	6/6	2.8 - 4.5	2.5E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	9.8E+00	5.1E+01	MG/KG	CAA06-SB18-1108	6/6	3.3 - 5.4	5.1E+01	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown background surface soil samples; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

TABLE 2.5a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

DSA - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	6 / 6	1.3E+04	CAA06-SB16-1108	7.7E+04	1E+00	0.2	NA	Developmental, Neurological
Thallium	1 / 6	8.0E-02 J	CAA06-SB16-1108	7.8E-01	1E+00	0.1	NA	Hair, Skin
Cumulative Corresponding Hazard Index[c]						**0.2**		
Cumulative Corresponding Cancer Risk[d]							**NA**	
						Total Developmental HI =		0.2
						Total Neurological HI =		0.2
						Total Hair HI =		0.1
						Total Skin HI =		0.1

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
TNT CBR Subsurface Soil	**121-14-2**	**2,4-Dinitrotoluene**	**7.8E-01**	**1.7E+00**	**MG/KG**	**CAA06-SB01-1008**	**2/7**	**0.099 - 0.45**	**1.7E+00**	**N/A**	**N/A**	**1.6E+00 C***	**YES**	**5.5E+00 C**	**NO**	**ASL-Res**
	99-65-0	**1,3-Dinitrobenzene**	**2.8E-02 J**	**1.6E+00 J**	**MG/KG**	**CAA06-SB01-1008**	**3/7**	**0.099 - 0.1**	**1.6E+00**	**N/A**	**N/A**	**6.1E-01 N**	**YES**	**6.2E+00 N**	**NO**	**ASL-Res**
	118-96-7	**2,4,6-Trinitrotoluene**	**1.4E+00**	**2.7E+03**	**MG/KG**	**CAA06-SB01-1008**	**4/7**	**0.1 - 30**	**2.7E+03**	**N/A**	**N/A**	**3.6E+00 C****	**YES**	**4.2E+01 C****	**YES**	**ASL-Res, ASL-Ind**
	35572-78-2	2-Amino-4,6-dinitrotoluene	6.1E-01 J	1.5E+01	MG/KG	CAA06-SB13-1108	3/7	0.099 - 0.1	1.5E+01	N/A	N/A	1.5E+01 N	YES	2.0E+02 N	NO	BSL
	618-87-1	3,5-Dinitroaniline	5.5E-01	5.5E-01	MG/KG	CAA06-SB13-1108	1/7	0.099 - 0.1	5.5E-01	N/A	N/A	N/A	N/A	N/A	N/A	NTX
	19406-51-0	**4-Amino-2,6-dinitrotoluene**	**3.4E-01**	**3.0E+01**	**MG/KG**	**CAA06-SB13-1108**	**2/7**	**0.099 - 0.1**	**3.0E+01**	**N/A**	**N/A**	**1.5E+01 N**	**YES**	**2.0E+02 N**	**NO**	**ASL-Res**
	7429-90-5	**Aluminum**	**4.2E+03**	**2.4E+04**	**MG/KG**	**CAA06-SB03-1008**	**7/7**	**14 - 23**	**2.4E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-38-2	**Arsenic**	**2.0E+00 L**	**2.1E+01 J**	**MG/KG**	**CAA06-SB01-1008**	**7/7**	**0.69 - 1.8**	**2.1E+01**	**5.5E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.4E+01 J	3.6E+01	MG/KG	CAA06-SB03-1008	7/7	14 - 23	3.6E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	3.4E-01 J	7.3E-01	MG/KG	CAA06-SB01-1008	7/7	0.35 - 0.57	7.3E-01	5.2E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	2.0E-02 J	1.1E-01 J	MG/KG	CAA06-SB04-1008	2/7	0.35 - 0.9	1.1E-01	ND	YES	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	1.0E+02 J	1.3E+03	MG/KG	CAA06-SB03-1008	7/7	350 - 570	1.3E+03	2.4E+03	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	**Chromium**	**5.2E+00**	**3.6E+01 L**	**MG/KG**	**CAA06-SB03-1008**	**7/7**	**0.69 - 1.8**	**3.6E+01**	**3.4E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	Cobalt	1.8E+00 J	5.0E+00 J	MG/KG	CAA06-SB03-1008	7/7	3.5 - 9	5.0E+00	5.2E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	3.9E+00	8.1E+00	MG/KG	CAA06-SB03-1008	4/7	1.7 - 2.8	8.1E+00	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	57-12-5	Cyanide	5.4E-01 J	5.4E-01 J	MG/KG	CAA06-SB13-1108	1/7	0.5 - 0.65	5.4E-01	2.7E+00	NO	1.6E+02 N	N/A	2.0E+03 N	N/A	BBK
	7439-89-6	**Iron**	**3.5E+03**	**3.5E+04 J**	**MG/KG**	**CAA06-SB01-1008**	**7/7**	**6.9 - 11**	**3.5E+04**	**3.2E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**NO**	**ASL-Res**
	7439-92-1	Lead	4.1E+00	3.5E+01	MG/KG	CAA06-SB13-1108	7/7	0.69 - 1.8	3.5E+01	8.8E+00	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	3.3E+02 J	1.4E+03	MG/KG	CAA06-SB03-1008	7/7	350 - 900	1.4E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	2.7E+01	1.1E+02	MG/KG	CAA06-SB01-1008	7/7	1 - 2.7	1.1E+02	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	5.0E-02 L	5.0E-02 L	MG/KG	CAA06-SB13-1108	1/7	0.086 - 0.14	5.0E-02	1.4E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	3.3E+00	1.7E+01	MG/KG	CAA06-SB03-1008	7/7	2.8 - 7.2	1.7E+01	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	2.0E+02 J	1.6E+03	MG/KG	CAA06-SB03-1008	7/7	350 - 570	1.6E+03	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	4.0E-01 J	1.6E+00 J	MG/KG	CAA06-SB03-1008	6/7	2.4 - 6.3	1.6E+00	6.4E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	3.0E+01 J	6.1E+01 J	MG/KG	CAA06-SB03-1008	4/7	350 - 570	6.1E+01	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-28-0	Thallium	7.0E-02 J	7.0E-02 J	MG/KG	CAA06-SB04-1008	1/7	1.7 - 4.5	7.0E-02	ND	YES	N/A	N/A	N/A	N/A	NTX
	7440-62-2	**Vanadium**	**6.9E+00**	**5.4E+01**	**MG/KG**	**CAA06-SB03-1008**	**7/7**	**3.5 - 9**	**5.4E+01**	**4.8E+01**	**YES**	**3.9E+01 N**	**YES**	**5.2E+02 N**	**NO**	**ASL-Res**
	7440-66-6	Zinc	7.6E+00 K	3.5E+01	MG/KG	CAA06-SB03-1008	7/7	4.2 - 6.8	3.5E+01	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.

[7] Rationale Codes

Selection Reason:	Above Residential Soil Screening Levels (ASL-Res)
	Above Industrial Soil Screening Levels (ASL-Ind)
Deletion Reason:	Below Background (BBK)
	Below Screening Level (BSL)
	No Toxicity Information (NTX)
	Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** = where N RSL < 10X c RSL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

TABLE 2.6a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Explosives (mg/kg)								
2,4-Dinitrotoluene	2 / 7	1.7E+00	CAA06-SB01-1008	1.6E+00	1E-06	NA	1E-06	NA
1,3-Dinitrobenzene	3 / 7	1.6E+00 J	CAA06-SB01-1008	6.1E+00	1	0.3	NA	Spleen
2,4,6-Trinitrotoluene	4 / 7	2.7E+03	CAA06-SB01-1008	1.9E+01	1E-06	NA	1E-04	NA
4-Amino-2,6-dinitrotoluene	2 / 7	3.0E+01	CAA06-SB13-1108	1.5E+02	1	0.2	NA	Neurotoxicity
Metals (mg/kg)								
Aluminum	7 / 7	2.4E+04	CAA06-SB03-1008	7.7E+04	1	0.3	NA	Developmental, Neurological
Arsenic	7 / 7	2.1E+01 J	CAA06-SB01-1008	3.9E-01	1E-06	NA	5E-05	NA
Chromium	7 / 7	3.6E+01 L	CAA06-SB03-1008	2.9E-01	1E-06	NA	1E-04	NA
Iron	7 / 7	3.5E+04 J	CAA06-SB01-1008	5.5E+04	1	0.6	NA	Gastrointestinal
Vanadium	7 / 7	5.4E+01	CAA06-SB03-1008	3.9E+02	1	0.1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**2**		
Cumulative Corresponding Cancer Risk[d]							**3E-04**	

Total Spleen HI =	0.3
Total Developmental HI =	0.3
Total Neurological/Neurotoxicity HI =	0.5
Total Kidney HI =	0.1
Total Gastrointestinal HI =	**0.6**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

L = Biased low

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.6b

Step 3 Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Subsurface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Explosives (mg/kg)									
2,4-Dinitrotoluene	2 / 7	1.2E+00	95% KM-t	1, 3, 4	1.6E+00	1E-06	NA	8E-07	NA
2,4,6-Trinitrotoluene	4 / 7	1.3E+03	95% KM-t	1, 3, 4	1.9E+01	1E-06	NA	7E-05	NA
Metals (mg/kg)									
Arsenic	7 / 7	1.4E+01	95% Stud-t	1, 2, 3, 4	3.9E-01	1E-06	NA	4E-05	NA
Chromium	7 / 7	2.9E+01	95% Stud-t	1, 2, 3, 4	2.9E-01	1E-06	NA	1E-04	NA
Iron	7 / 7	2.5E+04	95% Stud-t	1, 2, 3, 4	5.5E+04	1	0.4	NA	Gastrointestinal
Cumulative Corresponding Hazard Index[c]							**0.4**		
Cumulative Corresponding Cancer Risk[d]								**2E-04**	
								Total Gastrointestinal HI =	0.4

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (M); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Student's-T test UCL (95% Stud-t

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Max value used because 95% UCL greater than max.

Table 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier		Maximum [1] Concentration Qualifier		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value		COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
ASP Groundwater	**7429-90-5**	**Aluminum**	**2.9E+03**		**1.7E+04**		**UG/L**	**CAA06-DW02-1108**	**3/3**	**200 - 200**	**1.7E+04**	**2.2E+03**	**YES**	**3.7E+03**	**N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-38-2	**Arsenic**	**2.5E+01**		**4.7E+01**		**UG/L**	**CAA06-DW02-1108**	**2/3**	**10 - 10**	**4.7E+01**	**2.3E+00**	**YES**	**4.5E-02**	**C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	1.4E+01	J	3.2E+01	J	UG/L	CAA06-DW04P-1108	3/3	200 - 200	3.2E+01	1.2E+02	NO	7.3E+02	N	N/A	2.0E+03	N/A	BBK
	7440-41-7	Beryllium	4.5E-01	J	2.0E+00	J	UG/L	CAA06-DW02-1108	3/3	5 - 5	2.0E+00	2.5E+00	NO	7.3E+00	N	N/A	4.0E+00	N/A	BBK
	7440-43-9	Cadmium	3.3E-01	J	1.7E+00	J	UG/L	CAA06-DW02-1108	3/3	5 - 5	1.7E+00	6.1E-01	YES	1.8E+00	N	NO	5.0E+00	NO	BSL
	7440-70-2	Calcium	2.6E+04		4.1E+04		UG/L	CAA06-DW02-1108	3/3	5000 - 5000	4.1E+04	1.6E+05	NO	N/A		N/A	N/A	N/A	BBK
	7440-47-3	**Chromium**	**7.7E+00**	**J**	**4.3E+01**		**UG/L**	**CAA06-DW02-1108**	**3/3**	**10 - 10**	**4.3E+01**	**1.5E+01**	**YES**	**4.3E-02**	**C**	**YES**	**1.0E+02**	**NO**	**ASL-RSL**
	7440-48-4	**Cobalt**	**7.8E+00**	**J**	**3.0E+01**	**J**	**UG/L**	**CAA06-DW04P-1108**	**3/3**	**50 - 50**	**3.0E+01**	**2.1E+01**	**YES**	**1.1E+00**	**N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-89-6	**Iron**	**8.7E+03**		**1.3E+05**		**UG/L**	**CAA06-DW02-1108**	**3/3**	**100 - 100**	**1.3E+05**	**3.6E+03**	**YES**	**2.6E+03**	**N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**4.4E+00**	**J**	**2.2E+01**		**UG/L**	**CAA06-DW02-1108**	**3/3**	**10 - 10**	**2.2E+01**	**2.1E+01**	**YES**	**N/A**		**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	4.1E+03	J	6.7E+03		UG/L	CAA06-DW04-1108	3/3	5000 - 5000	6.7E+03	3.6E+03	YES	N/A		NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**3.2E+02**		**3.0E+03**		**UG/L**	**CAA06-DW04-1108**	**3/3**	**15 - 15**	**3.0E+03**	**5.8E+01**	**YES**	**8.8E+01**	**N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-97-6	Mercury	4.0E-02	J	4.0E-02	J	UG/L	CAA06-DW02-1108	1/3	0.2 - 0.2	4.0E-02	8.1E-02	NO	1.1E+00	N	N/A	2.0E+00	N/A	BBK
	7440-02-0	Nickel	1.2E+01	J	5.4E+01		UG/L	CAA06-DW02-1108	3/3	40 - 40	5.4E+01	1.1E+01	YES	7.3E+01	N	NO	N/A	N/A	BSL
	7440-09-7	Potassium	1.3E+03	J	4.6E+03	J	UG/L	CAA06-DW02-1108	3/3	5000 - 5000	4.6E+03	3.5E+03	YES	N/A		NUT	N/A	NUT	NUT
	7440-23-5	Sodium	1.1E+04		1.7E+04		UG/L	CAA06-DW04-1108	3/3	5000 - 5000	1.7E+04	9.9E+03	YES	N/A		NUT	N/A	NUT	NUT
	7440-62-2	**Vanadium**	**5.1E+00**	**J**	**5.2E+01**		**UG/L**	**CAA06-DW02-1108**	**3/3**	**50 - 50**	**5.2E+01**	**2.6E+01**	**YES**	**1.8E+01**	**N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	2.7E+01	J	1.6E+02		UG/L	CAA06-DW02-1108	3/3	60 - 60	1.6E+02	4.5E+00	YES	1.1E+03	N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs and MCLs.

[4] Background values from CAX/Yorktown groundwater background; values represent the 95% UTL.
Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009).
RSL value for Chromium(VI) used as surrogate for chromium.

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not Available or Not Applicable

TABLE 2.7a

Step 2 Groundwater Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 Ammonia Settling Pit Area - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	3 / 3	1.7E+04	CAA06-DW02-1108	3.7E+04	1	0.5	NA	Developmental, Neurological
Arsenic	2 / 3	4.7E+01	CAA06-DW02-1108	4.5E-02	1E-06	NA	1E-03	NA
Chromium	3 / 3	4.3E+01	CAA06-DW02-1108	4.3E-02	1E-06	NA	1E-03	NA
Cobalt	3 / 3	3.0E+01 J	CAA06-DW04P-1108	1.1E+01	1	3	NA	Thyroid
Iron	3 / 3	1.3E+05	CAA06-DW02-1108	2.6E+04	1	5	NA	Gastrointestinal
Lead	3 / 3	2.2E+01	CAA06-DW02-1108	NA	NA	NA	NA	NA
Manganese	3 / 3	3.0E+03	CAA06-DW04-1108	8.8E+02	1	3	NA	CNS
Vanadium	3 / 3	5.2E+01	CAA06-DW02-1108	1.8E+02	1	0.3	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**12**		
Cumulative Corresponding Cancer Risk[d]							**2E-03**	

Total Developmental HI =	0.5
Total CNS/Neurological HI =	**4**
Total Thyroid HI =	**3**
Total Gastrointestinal HI =	**5**
Total Kidney HI =	0.3

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

NA = Not available/not applicable

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
DSA Groundwater	**7429-90-5**	**Aluminum**	**1.2E+04**	**5.8E+04**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**200 - 200**	**5.8E+04**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-36-0	Antimony	3.6E+00 J	8.8E+00 J	UG/L	CAA06-DW09-1108	3/3	60 - 60	8.8E+00	1.9E+01	NO	1.5E+00 N	N/A	6.0E+00	N/A	BBK
	7440-38-2	**Arsenic**	**2.5E+01**	**1.3E+02**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**10 - 10**	**1.3E+02**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	6.9E+01 J	2.1E+02	UG/L	CAA06-DW09-1108	3/3	200 - 200	2.1E+02	1.2E+02	YES	7.3E+02 N	NO	2.0E+03	NO	BSL
	7440-41-7	**Beryllium**	**8.0E-01 J**	**4.1E+00 J**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**5 - 5**	**4.1E+00**	**2.5E+00**	**YES**	**7.3E+00 N**	**NO**	**4.0E+00**	**YES**	**ASL-MCL**
	7440-43-9	**Cadmium**	**5.7E-01 J**	**5.0E+00**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**5 - 5**	**5.0E+00**	**6.1E-01**	**YES**	**1.8E+00 N**	**YES**	**5.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7440-70-2	Calcium	2.8E+05	6.6E+05	UG/L	CAA06-DW09-1108	3/3	5000 - 5000	6.6E+05	1.6E+05	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**5.9E+01**	**2.5E+02**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**10 - 10**	**2.5E+02**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	**Cobalt**	**6.0E+00 J**	**2.3E+01 J**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**50 - 50**	**2.3E+01**	**2.1E+01**	**YES**	**1.1E+00 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-50-8	Copper	2.3E+01 J	6.0E+01	UG/L	CAA06-DW09-1108	3/3	25 - 25	6.0E+01	1.2E+01	YES	1.5E+02 N	NO	1.3E+03	NO	BSL
	7439-89-6	**Iron**	**2.8E+04**	**1.2E+05**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**100 - 100**	**1.2E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**1.2E+01**	**5.0E+01**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**10 - 10**	**5.0E+01**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	5.5E+03	2.1E+04	UG/L	CAA06-DW09-1108	3/3	5000 - 5000	2.1E+04	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**1.1E+02 J**	**4.2E+02**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**15 - 15**	**4.2E+02**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-97-6	Mercury	4.0E-02 L	4.0E-02 L	UG/L	CAA06-DW09-1108	1/3	0.2 - 0.2	4.0E-02	8.1E-02	NO	1.1E+00 N	N/A	2.0E+00	N/A	BBK
	7440-02-0	**Nickel**	**2.7E+01 J**	**8.7E+01**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**40 - 40**	**8.7E+01**	**1.1E+01**	**YES**	**7.3E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-09-7	Potassium	5.7E+03	2.3E+04	UG/L	CAA06-DW09-1108	3/3	5000 - 5000	2.3E+04	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	5.5E+00 J	5.8E+00 J	UG/L	CAA06-DW09-1108	2/3	35 - 35	5.8E+00	ND	YES	1.8E+01 N	NO	5.0E+01	NO	BSL
	7440-23-5	Sodium	7.3E+03	2.4E+04	UG/L	CAA06-DW09-1108	3/3	5000 - 5000	2.4E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-28-0	**Thallium**	**1.7E+00 J**	**2.2E+00 J**	**UG/L**	**CAA06-DW11-1108**	**3/3**	**25 - 25**	**2.2E+00**	ND	**YES**	**3.7E-02 N**	**YES**	**2.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7440-62-2	**Vanadium**	**5.2E+01**	**3.3E+02**	**UG/L**	**CAA06-DW09-1108**	**3/3**	**50 - 50**	**3.3E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	6.0E+01	2.3E+02	UG/L	CAA06-DW09-1108	3/3	60 - 60	2.3E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs and MCLs.

[4] Background values from CAX/Yorktown groundwater background; values represent the 95% UTL.
Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.

[5] Oak Ridge National Laboratory (ORNL). June, 2011. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009). Available: http://water.epa.gov/drink/contaminants/index.cfm
RSL value for Chromium(VI) used as surrogate for chromium.

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
N/A = Not Available or Not Applicable
ND = Not Detected

TABLE 2.8a

Step 2 Groundwater Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 1918 Drum Storage Area - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	3 / 3	5.8E+04	CAA06-DW09-1108	3.7E+04	1	2	NA	Developmental, Neurological
Arsenic	3 / 3	1.3E+02	CAA06-DW09-1108	4.5E-02	1E-06	NA	3E-03	NA
Beryllium	3 / 3	4.1E+00 J	CAA06-DW09-1108	7.3E+01	1	0.1	NA	Gastrointestinal
Cadmium	3 / 3	5.0E+00	CAA06-DW09-1108	1.8E+01	1	0.3	NA	Kidney
Chromium	3 / 3	2.5E+02	CAA06-DW09-1108	4.3E-02	1E-06	NA	6E-03	NA
Cobalt	3 / 3	2.3E+01 J	CAA06-DW09-1108	1.1E+01	1	2	NA	Thyroid
Iron	3 / 3	1.2E+05	CAA06-DW09-1108	2.6E+04	1	4	NA	Gastrointestinal
Lead	3 / 3	5.0E+01	CAA06-DW09-1108	NA	NA	NA	NA	NA
Manganese	3 / 3	4.2E+02	CAA06-DW09-1108	8.8E+02	1	0.5	NA	CNS
Nickel	3 / 3	8.7E+01	CAA06-DW09-1108	7.3E+02	1	0.1	NA	Decreased Body Weight, Decreased Organ Weight
Thallium	3 / 3	2.2E+00 J	CAA06-DW11-1108	3.7E-01	1	6	NA	Hair, Skin
Vanadium	3 / 3	3.3E+02	CAA06-DW09-1108	1.8E+02	1	2	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**17**	NA	
Cumulative Corresponding Cancer Risk[d]							**9E-03**	

Total Developmental HI =	**2**
Total CNS/Neurological HI =	**2**
Total Kidney HI =	**2**
Total Thyroid HI =	**2**
Total Gastrointestinal HI =	**4**
Total Decreased Body Weight HI =	0.1
Total Decreased Organ Weight HI =	0.1
Total Hair HI =	6
Total Skin HI =	6

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

NA = Not available/not applicable

Table 2.9

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
TNT CBR Groundwater	**7429-90-5**	**Aluminum**	**1.7E+03**	**3.5E+04**	**UG/L**	**CAA06-DW07-1108**	**4/4**	**200 - 200**	**3.5E+04**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-36-0	Antimony	7.8E-01 J	7.8E-01 J	UG/L	CAA06-DW07-1108	1/3	60 - 60	7.8E-01	1.9E+01	NO	1.5E+00 N	N/A	6.0E+00	N/A	BBK
	7440-38-2	**Arsenic**	**3.7E+01**	**1.6E+02**	**UG/L**	**CAA06-DW07-1108**	**4/4**	**10 - 10**	**1.6E+02**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	1.3E+01 J	8.9E+01 J	UG/L	CAA06-DW07-1108	4/4	200 - 200	8.9E+01	1.2E+02	NO	7.3E+02 N	N/A	2.0E+03	N/A	BBK
	7440-41-7	**Beryllium**	**2.9E-01 J**	**4.8E+00 J**	**UG/L**	**CAA06-DW07-1108**	**3/4**	**5 - 5**	**4.8E+00**	**2.5E+00**	**YES**	**7.3E+00 N**	**NO**	**4.0E+00**	**YES**	**ASL-MCL**
	7440-70-2	Calcium	3.9E+04	5.6E+04	UG/L	CAA06-DW07-1108	4/4	5000 - 5000	5.6E+04	1.6E+05	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	**Chromium**	**5.0E+00 J**	**1.5E+02**	**UG/L**	**CAA06-DW07-1108**	**3/4**	**10 - 10**	**1.5E+02**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	**Cobalt**	**5.3E-01 J**	**2.2E+01 J**	**UG/L**	**CAA06-DW07-1108**	**4/4**	**50 - 50**	**2.2E+01**	**2.1E+01**	**YES**	**1.1E+00 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-50-8	Copper	6.0E+00 J	4.4E+01	UG/L	CAA06-DW06-1108	3/4	25 - 25	4.4E+01	1.2E+01	YES	1.5E+02 N	NO	1.3E+03	NO	BSL
	7439-89-6	**Iron**	**2.5E+04**	**2.3E+05**	**UG/L**	**CAA06-DW07-1108**	**4/4**	**100 - 100**	**2.3E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**3.3E+00 J**	**7.2E+01**	**UG/L**	**CAA06-DW07-1108**	**3/4**	**10 - 10**	**7.2E+01**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	2.9E+03 J	7.3E+03	UG/L	CAA06-DW07-1108	4/4	5000 - 5000	7.3E+03	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**2.4E+02**	**7.0E+02**	**UG/L**	**CAA06-DW07-1108**	**4/4**	**15 - 15**	**7.0E+02**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-97-6	Mercury	3.0E-02 J	4.0E-02 J	UG/L	CAA06-DW07-1108	2/4	0.2 - 0.2	4.0E-02	8.1E-02	NO	1.1E+00 N	N/A	2.0E+00	N/A	BBK
	7440-02-0	Nickel	6.2E+01	6.3E+01	UG/L	CAA06-DW07-1108	2/4	40 - 40	6.3E+01	1.1E+01	YES	7.3E+01 N	NO	N/A	N/A	BSL
	7440-09-7	Potassium	2.9E+03 J	9.1E+03	UG/L	CAA06-DW07-1108	4/4	5000 - 5000	9.1E+03	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	2.1E+00 J	2.1E+00 J	UG/L	CAA06-DW07-1108	1/4	35 - 35	2.1E+00	ND	YES	1.8E+01 N	NO	5.0E+01	NO	BSL
	7440-22-4	Silver	7.7E-01 J	5.0E+00 J	UG/L	CAA06-DW07-1108	3/4	10 - 10	5.0E+00	ND	YES	1.8E+01 N	NO	N/A	N/A	BSL
	7440-23-5	Sodium	1.1E+04	1.2E+04	UG/L	CAA06-DW08-1108	4/4	5000 - 5000	1.2E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-62-2	**Vanadium**	**3.6E+00 J**	**1.6E+02**	**UG/L**	**CAA06-DW07-1108**	**4/4**	**50 - 50**	**1.6E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	8.9E+00 J	2.1E+02	UG/L	CAA06-DW06-1108	3/4	60 - 60	2.1E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs and MCLs.

[4] Background values from CAX/Yorktown groundwater background; values represent the 95% UTL.
Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009). Available: http://water.epa.gov/drink/contaminants/index.cfm
RSL value for Chromium(VI) used as surrogate for chromium.

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not Available or Not Applicable
ND = Not Detected

TABLE 2.9a

Step 2 Groundwater Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (ug/L)								
Aluminum	4 / 4	3.5E+04	CAA06-DW07-1108	3.7E+04	1	0.9	NA	Developmental, Neurological
Arsenic	4 / 4	1.6E+02	CAA06-DW07-1108	4.5E-02	1E-06	NA	4E-03	NA
Beryllium	3 / 4	4.8E+00 J	CAA06-DW07-1108	7.3E+01	1	0.1	NA	Gastrointestinal
Chromium	3 / 4	1.5E+02	CAA06-DW07-1108	4.3E-02	1E-06	NA	4E-03	NA
Cobalt	4 / 4	2.2E+01 J	CAA06-DW07-1108	1.1E+01	1	2	NA	Thyroid
Iron	4 / 4	2.3E+05	CAA06-DW07-1108	2.6E+04	1	9	NA	Gastrointestinal
Lead	3 / 4	7.2E+01	CAA06-DW07-1108	NA	NA	NA	NA	NA
Manganese	4 / 4	7.0E+02	CAA06-DW07-1108	8.8E+02	1	0.8	NA	CNS
Vanadium	4 / 4	1.6E+02	CAA06-DW07-1108	1.8E+02	1	0.9	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**14**	NA	
Cumulative Corresponding Cancer Risk[d]							**7E-03**	

Total Developmental HI =	**0.9**
Total CNS/Neurological HI =	**2**
Total Kidney HI =	**0.9**
Total Thyroid HI =	**2**
Total Gastrointestinal HI =	**9**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

NA = Not available/not applicable

Table 2.10

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	COPC Flag	Screening [4] Toxicity Value	COPC Flag	Screening [5] MCL Value	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
Surface Water	117-84-0	Di-n-octylphthalate	2.2E+00 J	2.2E+00 J	UG/L	CAA06-SW02-1008	1/1	10 - 10	2.2E+00	N/A	N/A	N/A	N/A	N/A	N/A	NTX
ASP	7440-39-3	Barium	2.0E+01 J	2.0E+01 J	UG/L	CAA06-SW02-1008	1/1	200 - 200	2.0E+01	N/A	N/A	7.3E+03 N	NO	2.0E+03	NO	BSL
	7440-70-2	Calcium	3.2E+04	3.2E+04	UG/L	CAA06-SW02-1008	1/1	5000 - 5000	3.2E+04	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-89-6	Iron	2.8E+02	2.8E+02	UG/L	CAA06-SW02-1008	1/1	100 - 100	2.8E+02	N/A	N/A	2.6E+04 N	NO	N/A	N/A	BSL
	7439-95-4	Magnesium	1.9E+03 J	1.9E+03 J	UG/L	CAA06-SW02-1008	1/1	5000 - 5000	1.9E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	3.9E+01	3.9E+01	UG/L	CAA06-SW02-1008	1/1	15 - 15	3.9E+01	N/A	N/A	8.8E+02 N	NO	N/A	N/A	BSL
	7440-09-7	Potassium	3.0E+03 J	3.0E+03 J	UG/L	CAA06-SW02-1008	1/1	5000 - 5000	3.0E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-23-5	Sodium	1.2E+04	1.2E+04	UG/L	CAA06-SW02-1008	1/1	5000 - 5000	1.2E+04	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-62-2	Vanadium	4.1E-01 J	4.1E-01 J	UG/L	CAA06-SW02-1008	1/1	50 - 50	4.1E-01	N/A	N/A	1.8E+02 N	NO	N/A	N/A	BSL
	7440-66-6	Zinc	3.4E+00 J	3.4E+00 J	UG/L	CAA06-SW02-1008	1/1	60 - 60	3.4E+00	N/A	N/A	1.1E+04 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online].
Tap Water RSLs times 10 after adjusted to a noncancer HI of 0.1. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009).

[6] Rationale Codes

Selection Reason: Above Surface Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not available or Not applicable

Table 2.11

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	COPC Flag	Screening [4] Toxicity Value	COPC Flag	Screening [5] MCL Value	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
Surface Water	117-81-7	bis(2-Ethylhexyl)phthalate	2.1E+00 J	2.1E+00 J	UG/L	CAA06-SW01-1008	1/1	10 - 10	2.1E+00	N/A	N/A	4.8E+01 C	NO	6.0E+00	NO	BSL
TNT	121-82-4	RDX	1.6E-01 J	1.6E-01 J	UG/L	CAA06-SW01-1008	1/1	0.4 - 0.4	1.6E-01	N/A	N/A	6.1E+00 C	NO	N/A	N/A	BSL
	7440-39-3	Barium	2.0E+01 J	2.0E+01 J	UG/L	CAA06-SW01-1008	1/1	200 - 200	2.0E+01	N/A	N/A	7.3E+03 N	NO	2.0E+03	NO	BSL
	7440-70-2	Calcium	3.1E+04	3.1E+04	UG/L	CAA06-SW01-1008 : CAA06-SW01P-1008	1/1	5000 - 5000	3.1E+04	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-89-6	Iron	2.4E+02	2.4E+02	UG/L	CAA06-SW01P-1008	1/1	100 - 100	2.4E+02	N/A	N/A	2.6E+04 N	NO	N/A	N/A	BSL
	7439-95-4	Magnesium	1.9E+03 J	1.9E+03 J	UG/L	CAA06-SW01-1008	1/1	5000 - 5000	1.9E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	3.7E+01	3.7E+01	UG/L	CAA06-SW01-1008	1/1	15 - 15	3.7E+01	N/A	N/A	8.8E+02 N	NO	N/A	N/A	BSL
	7440-09-7	Potassium	2.9E+03 J	2.9E+03 J	UG/L	CAA06-SW01-1008	1/1	5000 - 5000	2.9E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-23-5	Sodium	1.2E+04	1.2E+04	UG/L	CAA06-SW01P-1008	1/1	5000 - 5000	1.2E+04	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-28-0	Thallium	1.7E+00 J	1.7E+00 J	UG/L	CAA06-SW01-1008	1/1	25 - 25	1.7E+00	N/A	N/A	N/A	N/A	2.0E+00	NO	BSL
	7440-66-6	Zinc	3.4E+00 J	3.4E+00 J	UG/L	CAA06-SW01-1008	1/1	60 - 60	3.4E+00	N/A	N/A	1.1E+04 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL).November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. [Online].
Tap Water RSLs times 10 after adjusted to a noncancer HI of 0.1. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2004).

[6] Rationale Codes

Selection Reason: Above Surface Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
N/A = Not available or Not applicable

Table 2.12

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Sediment
Exposure Medium: Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background Value	COPC Flag	Screening [4] Toxicity Value	COPC Flag	Screening [5] Toxicity Value	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
ASP Surface Sediment	7429-90-5	Aluminum	1.5E+03	1.5E+03	MG/KG	CAA06-SD02-1008	1/1	16 - 16	1.5E+03	N/A	N/A	7.7E+04 N	NO	9.9E+05 NM	NO	BSL
	7440-38-2	Arsenic	1.2E+00 J	1.2E+00 J	MG/KG	CAA06-SD02-1008	1/1	0.81 - 0.81	1.2E+00	N/A	N/A	3.9E+00 C*	NO	1.6E+01 C	NO	BSL
	7440-39-3	Barium	4.1E+00 J	4.1E+00 J	MG/KG	CAA06-SD02-1008	1/1	16 - 16	4.1E+00	N/A	N/A	1.5E+04 N	NO	1.9E+05 NM	NO	BSL
	7440-41-7	Beryllium	7.0E-02 J	7.0E-02 J	MG/KG	CAA06-SD02-1008	1/1	0.4 - 0.4	7.0E-02	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7440-70-2	Calcium	6.1E+02	6.1E+02	MG/KG	CAA06-SD02-1008	1/1	400 - 400	6.1E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	2.9E+00 J	2.9E+00 J	MG/KG	CAA06-SD02-1008	1/1	0.81 - 0.81	2.9E+00	N/A	N/A	2.9E+00 C	NO	5.6E+01 C	NO	BSL
	7440-48-4	Cobalt	3.5E-01 J	3.5E-01 J	MG/KG	CAA06-SD02-1008	1/1	4 - 4	3.5E-01	N/A	N/A	2.3E+01 N	NO	3.0E+02 N	NO	BSL
	7439-89-6	Iron	1.8E+03 J	1.8E+03 J	MG/KG	CAA06-SD02-1008	1/1	8.1 - 8.1	1.8E+03	N/A	N/A	5.5E+04 N	NO	7.2E+05 NM	NO	BSL
	7439-92-1	Lead	2.9E+00 J	2.9E+00 J	MG/KG	CAA06-SD02-1008	1/1	0.81 - 0.81	2.9E+00	N/A	N/A	4.0E+02 N	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	1.1E+02 J	1.1E+02 J	MG/KG	CAA06-SD02-1008	1/1	400 - 400	1.1E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	1.5E+01	1.5E+01	MG/KG	CAA06-SD02-1008	1/1	1.2 - 1.2	1.5E+01	N/A	N/A	1.8E+03 N	NO	2.3E+04 N	NO	BSL
	7440-02-0	Nickel	8.8E-01 J	8.8E-01 J	MG/KG	CAA06-SD02-1008	1/1	3.2 - 3.2	8.8E-01	N/A	N/A	1.5E+03 N	NO	2.0E+04 N	NO	BSL
	7440-09-7	Potassium	9.9E+01 J	9.9E+01 J	MG/KG	CAA06-SD02-1008	1/1	400 - 400	9.9E+01	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-23-5	Sodium	1.1E+01 J	1.1E+01 J	MG/KG	CAA06-SD02-1008	1/1	400 - 400	1.1E+01	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-62-2	Vanadium	3.8E+00 J	3.8E+00 J	MG/KG	CAA06-SD02-1008	1/1	4 - 4	3.8E+00	N/A	N/A	3.9E+02 N	NO	5.2E+03 N	NO	BSL
	7440-66-6	Zinc	6.9E+00	6.9E+00	MG/KG	CAA06-SD02-1008	1/1	4.8 - 4.8	6.9E+00	N/A	N/A	2.3E+04 N	NO	3.1E+05 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1) . Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
The industrial soil value of 800 mg/kg for lead is from the adult lead model.

[6] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
C* = where: N RSL < 100X C RSL
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

Table 2.13

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Subsurface Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background Value	COPC Flag	Screening [4] Toxicity Value	COPC Flag	Screening [5] Toxicity Value	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
ASP	118-96-7	2,4,6-Trinitrotoluene	1.5E-01	1.5E-01	MG/KG	CAA06-SSD02-1008	1/1	0.1 - 0.1	1.5E-01	N/A	N/A	3.6E+00 N	NO	4.2E+01 N	NO	BSL
Subsurface	7429-90-5	Aluminum	5.8E+03	5.8E+03	MG/KG	CAA06-SSD02-1008	1/1	16 - 16	5.8E+03	N/A	N/A	7.7E+04 N	NO	9.9E+05 NM	NO	BSL
Sediment	**7440-38-2**	**Arsenic**	**4.6E+00 J**	**4.6E+00 J**	**MG/KG**	**CAA06-SSD02-1008**	**1/1**	**0.81 - 0.81**	**4.6E+00**	**N/A**	**N/A**	**3.9E+00 C***	**YES**	**1.6E+01 C**	**NO**	**ASL-Res**
	7440-39-3	Barium	1.6E+01	1.6E+01	MG/KG	CAA06-SSD02-1008	1/1	16 - 16	1.6E+01	N/A	N/A	1.5E+04 N	NO	1.9E+05 NM	NO	BSL
	7440-41-7	Beryllium	1.9E-01 J	1.9E-01 J	MG/KG	CAA06-SSD02-1008	1/1	0.4 - 0.4	1.9E-01	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7440-70-2	Calcium	3.0E+03	3.0E+03	MG/KG	CAA06-SSD02-1008	1/1	400 - 400	3.0E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**7.6E+00 J**	**7.6E+00 J**	**MG/KG**	**CAA06-SSD02-1008**	**1/1**	**0.81 - 0.81**	**7.6E+00**	**N/A**	**N/A**	**2.9E+00 C**	**YES**	**5.6E+01 C**	**NO**	**ASL-Res**
	7440-48-4	Cobalt	1.2E+00 J	1.2E+00 J	MG/KG	CAA06-SSD02-1008	1/1	4 - 4	1.2E+00	N/A	N/A	2.3E+01 N	NO	3.0E+02 N	NO	BSL
	7440-50-8	Copper	4.0E+00	4.0E+00	MG/KG	CAA06-SSD02-1008	1/1	2 - 2	4.0E+00	N/A	N/A	3.10E+03 N	NO	4.10E+04 N	NO	BSL
	7439-89-6	Iron	4.7E+03 J	4.7E+03 J	MG/KG	CAA06-SSD02-1008	1/1	8.1 - 8.1	4.7E+03	N/A	N/A	5.5E+04 N	NO	7.2E+05 NM	NO	BSL
	7439-92-1	Lead	1.2E+01 J	1.2E+01 J	MG/KG	CAA06-SSD02-1008	1/1	0.81 - 0.81	1.2E+01	N/A	N/A	4.0E+02 N	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	4.2E+02	4.2E+02	MG/KG	CAA06-SSD02-1008	1/1	400 - 400	4.2E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	5.3E+01	5.3E+01	MG/KG	CAA06-SSD02-1008	1/1	1.2 - 1.2	5.3E+01	N/A	N/A	1.8E+03 N	NO	2.3E+04 N	NO	BSL
	7440-02-0	Nickel	3.3E+00	3.3E+00	MG/KG	CAA06-SSD02-1008	1/1	3.2 - 3.2	3.3E+00	N/A	N/A	1.5E+03 N	NO	2.0E+04 N	NO	BSL
	7440-09-7	Potassium	2.9E+02 J	2.9E+02 J	MG/KG	CAA06-SSD02-1008	1/1	400 - 400	2.9E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-23-5	Sodium	3.8E+01 J	3.8E+01 J	MG/KG	CAA06-SSD02-1008	1/1	400 - 400	3.8E+01	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-62-2	Vanadium	1.0E+01 J	1.0E+01 J	MG/KG	CAA06-SSD02-1008	1/1	4 - 4	1.0E+01	N/A	N/A	3.9E+02 N	NO	5.2E+03 N	NO	BSL
	7440-66-6	Zinc	2.9E+01	2.9E+01	MG/KG	CAA06-SSD02-1008	1/1	4.8 - 4.8	2.9E+01	N/A	N/A	2.3E+04 N	NO	3.1E+05 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1) . Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
RSL value for Chromium(VI) used as surrogate for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
The industrial soil value of 800 mg/kg for lead is from the adult lead model.

[6] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
C = Carcinogenic
C* = where: N RSL < 100X C RSL
C** = where N RSL < 10X C RSL, therefore, N RSL used
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

TABLE 2.13a

Step 2 Subsurface Sediment - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 Ammonia Settling Pit Area - Subsurface Sediment

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL x10	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Arsenic	1 / 1	4.6E+00 J	CAA06-SSD02-1008	3.9E+00	1E-06	NA	1E-06	NA
Chromium	1 / 1	7.6E+00 J	CAA06-SSD02-1008	2.9E+00	1E-06	NA	3E-06	NA
Cumulative Corresponding Hazard Index[c]						**NA**		
Cumulative Corresponding Cancer Risk[d]							**4E-06**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.14

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Sediment
Exposure Medium: Surface Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background Value	COPC Flag	Screening [4] Toxicity Value	COPC Flag	Screening [5] Toxicity Value	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
TNT CBR Surface Sediment	117-81-7	bis(2-Ethylhexyl)phthalate	3.3E+00 J	3.3E+00 J	MG/KG	CAA06-SD01-1008	1/1	0.48 - 1.2	3.3E+00	N/A	N/A	3.5E+02 C*	NO	1.2E+03 C	NO	BSL
	117-84-0	Di-n-octylphthalate	2.5E+00 J	2.5E+00 J	MG/KG	CAA06-SD01-1008	1/1	0.48 - 1.2	2.5E+00	N/A	N/A	N/A	N/A	N/A	N/A	NTX
	19406-51-0	4-Amino-2,6-dinitrotoluene	1.1E-01	1.1E-01	MG/KG	CAA06-SD01P-1008	1/1	0.099 - 0.1	1.1E-01	N/A	N/A	1.5E+02 N	NO	1.9E+03 N	NO	BSL
	7429-90-5	Aluminum	2.2E+03 J	2.2E+03 J	MG/KG	CAA06-SD01-1008	1/1	15 - 41	2.2E+03	N/A	N/A	7.7E+04 N	NO	9.9E+05 NM	NO	BSL
	7440-36-0	Antimony	1.7E-01 L	1.7E-01 L	MG/KG	CAA06-SD01-1008	1/1	4.5 - 12	1.7E-01	N/A	N/A	3.1E+01 N	NO	4.1E+02 N	NO	BSL
	7440-38-2	**Arsenic**	**1.2E+01 J**	**1.2E+01 J**	**MG/KG**	**CAA06-SD01-1008**	**1/1**	**0.74 - 2.1**	**1.2E+01**	**N/A**	**N/A**	**3.9E+00 C***	**YES**	**1.6E+01 C**	**NO**	**ASL-Res**
	7440-39-3	Barium	9.4E+00 J	9.4E+00 J	MG/KG	CAA06-SD01-1008	1/1	15 - 41	9.4E+00	N/A	N/A	1.5E+04 N	NO	1.9E+05 NM	NO	BSL
	7440-41-7	Beryllium	1.8E-01 J	1.8E-01 J	MG/KG	CAA06-SD01-1008	1/1	0.37 - 1	1.8E-01	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7440-70-2	Calcium	1.7E+03 J	1.7E+03 J	MG/KG	CAA06-SD01-1008	1/1	370 - 1000	1.7E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**5.0E+00 J**	**5.0E+00 J**	**MG/KG**	**CAA06-SD01-1008**	**1/1**	**0.74 - 2.1**	**5.0E+00**	**N/A**	**N/A**	**2.9E+00 C**	**YES**	**5.6E+01 C**	**NO**	**ASL-Res**
	7440-48-4	Cobalt	6.7E-01 J	6.7E-01 J	MG/KG	CAA06-SD01-1008	1/1	3.7 - 10	6.7E-01	N/A	N/A	2.3E+01 N	NO	3.0E+02 N	NO	BSL
	7439-89-6	Iron	4.8E+03 J	4.8E+03 J	MG/KG	CAA06-SD01-1008	1/1	7.4 - 21	4.8E+03	N/A	N/A	5.5E+04 N	NO	7.2E+05 NM	NO	BSL
	7439-92-1	Lead	1.1E+01 J	1.1E+01 J	MG/KG	CAA06-SD01-1008	1/1	0.74 - 2.1	1.1E+01	N/A	N/A	4.0E+02 N	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	2.1E+02 J	2.1E+02 J	MG/KG	CAA06-SD01-1008	1/1	370 - 1000	2.1E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	3.7E+01	3.7E+01	MG/KG	CAA06-SD01-1008	1/1	1.1 - 3.1	3.7E+01	N/A	N/A	1.8E+03 N	NO	2.3E+04 N	NO	BSL
	7440-02-0	Nickel	1.7E+00 J	1.7E+00 J	MG/KG	CAA06-SD01-1008	1/1	3 - 8.2	1.7E+00	N/A	N/A	1.5E+03 N	NO	2.0E+04 N	NO	BSL
	7440-09-7	Potassium	2.0E+02 J	2.0E+02 J	MG/KG	CAA06-SD01-1008	1/1	370 - 1000	2.0E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-23-5	Sodium	2.9E+01 J	2.9E+01 J	MG/KG	CAA06-SD01-1008	1/1	370 - 1000	2.9E+01	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-62-2	Vanadium	5.9E+00 J	5.9E+00 J	MG/KG	CAA06-SD01-1008	1/1	3.7 - 10	5.9E+00	N/A	N/A	3.9E+02 N	NO	5.2E+03 N	NO	BSL
	7440-66-6	Zinc	1.2E+01	1.2E+01	MG/KG	CAA06-SD01-1008	1/1	4.5 - 12	1.2E+01	N/A	N/A	2.3E+04 N	NO	3.1E+05 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1) . Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
The industrial soil value of 800 mg/kg for lead is from the adult lead model.

[6] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

TABLE 2.14a

Step 2 Surface Sediment - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Surface Sediment

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL x 10	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Arsenic	1 / 1	1.2E+01 J	CAA06-SD01-1008	3.9E+00	1E-06	NA	3E-06	NA
Chromium	1 / 1	5.0E+00 J	CAA06-SD01-1008	2.9E+00	1E-06	NA	2E-06	NA
Cumulative Corresponding Hazard Index[c]						**NA**		
Cumulative Corresponding Cancer Risk[d]							**5E-06**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.15

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 6

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Sediment
Exposure Medium: Subsurface Sediment

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background Value	COPC Flag	Screening [4] Toxicity Value	COPC Flag	Screening [5] Toxicity Value	COPC Flag	Rationale for [6] Contaminant Deletion or Selection
TNT CBR Subsurface Sediment	7429-90-5	Aluminum	1.7E+03	1.7E+03	MG/KG	CAA06-SSD01-1008	1/1	20 - 20	1.7E+03	N/A	N/A	7.7E+04 N	NO	9.9E+05 NM	NO	BSL
	7440-36-0	Antimony	1.8E-01 L	1.8E-01 L	MG/KG	CAA06-SSD01-1008	1/1	6 - 6	1.8E-01	N/A	N/A	3.1E+01 N	NO	4.1E+02 N	NO	BSL
	7440-38-2	**Arsenic**	**6.9E+00 J**	**6.9E+00 J**	**MG/KG**	**CAA06-SSD01-1008**	**1/1**	**1 - 1**	**6.9E+00**	**N/A**	**N/A**	**3.9E+00 C***	**YES**	**1.6E+01 C**	**NO**	**ASL-Res**
	7440-39-3	Barium	8.3E+00 J	8.3E+00 J	MG/KG	CAA06-SSD01-1008	1/1	20 - 20	8.3E+00	N/A	N/A	1.5E+04 N	NO	1.9E+05 NM	NO	BSL
	7440-41-7	Beryllium	1.2E-01 J	1.2E-01 J	MG/KG	CAA06-SSD01-1008	1/1	0.5 - 0.5	1.2E-01	N/A	N/A	1.6E+02 N	NO	2.0E+03 N	NO	BSL
	7440-70-2	Calcium	2.8E+03	2.8E+03	MG/KG	CAA06-SSD01-1008	1/1	500 - 500	2.8E+03	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-47-3	Chromium	2.9E+00 J	2.9E+00 J	MG/KG	CAA06-SSD01-1008	1/1	1 - 1	2.9E+00	N/A	N/A	2.9E+00 C	NO	5.6E+01 C	NO	BSL
	7440-48-4	Cobalt	4.9E-01 J	4.9E-01 J	MG/KG	CAA06-SSD01-1008	1/1	5 - 5	4.9E-01	N/A	N/A	2.3E+01 N	NO	3.0E+02 N	NO	BSL
	7440-50-8	Copper	2.7E+00	2.7E+00	MG/KG	CAA06-SSD01-1008	1/1	2.5 - 2.5	2.7E+00	N/A	N/A	3.10E+03 N	NO	4.10E+04 N	NO	BSL
	7439-89-6	Iron	3.6E+03 J	3.6E+03 J	MG/KG	CAA06-SSD01-1008	1/1	10 - 10	3.6E+03	N/A	N/A	5.5E+04 N	NO	7.2E+05 NM	NO	BSL
	7439-92-1	Lead	6.4E+00 J	6.4E+00 J	MG/KG	CAA06-SSD01-1008	1/1	1 - 1	6.4E+00	N/A	N/A	4.0E+02 N	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	1.7E+02 J	1.7E+02 J	MG/KG	CAA06-SSD01-1008	1/1	500 - 500	1.7E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	3.8E+01	3.8E+01	MG/KG	CAA06-SSD01-1008	1/1	1.5 - 1.5	3.8E+01	N/A	N/A	1.8E+03 N	NO	2.3E+04 N	NO	BSL
	7440-02-0	Nickel	1.3E+00 J	1.3E+00 J	MG/KG	CAA06-SSD01-1008	1/1	4 - 4	1.3E+00	N/A	N/A	1.5E+03 N	NO	2.0E+04 N	NO	BSL
	7440-09-7	Potassium	1.4E+02 J	1.4E+02 J	MG/KG	CAA06-SSD01-1008	1/1	500 - 500	1.4E+02	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-23-5	Sodium	2.9E+01 J	2.9E+01 J	MG/KG	CAA06-SSD01-1008	1/1	500 - 500	2.9E+01	N/A	N/A	N/A	NUT	N/A	NUT	NUT
	7440-62-2	Vanadium	4.4E+00 J	4.4E+00 J	MG/KG	CAA06-SSD01-1008	1/1	5 - 5	4.4E+00	N/A	N/A	3.9E+02 N	NO	5.2E+03 N	NO	BSL
	7440-66-6	Zinc	1.0E+01	1.0E+01	MG/KG	CAA06-SSD01-1008	1/1	6 - 6	1.0E+01	N/A	N/A	2.3E+04 N	NO	3.1E+05 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs times 10 (after adjusted for noncancer to a hazard of 0.1) . Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
The industrial soil value of 800 mg/kg for lead is from the adult lead model.

[6] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)

COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
L = Biased Low
C = Carcinogenic
C* = where: N RSL < 100X C RSL
N = Noncarcinogenic
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

TABLE 2.15a

Step 2 Subsurface Sediment - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 6 TNT Graining House Area - Suburface Sediment

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL x 10	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Arsenic	1 / 1	6.9E+00 J	CAA06-SSD01-1008	3.9E+00	1E-06	NA	2E-06	NA
Cumulative Corresponding Hazard Index[c]						**NA**		
Cumulative Corresponding Cancer Risk[d]							**2E-06**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Attachment A.4—AOC 7

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil AOC 7	108-95-2	Phenol	4.2E-01 J	4.2E-01 J	MG_KG	CAA07-SS02-1008	1/7	0.36 - 0.42	4.2E-01	N/A	N/A	1.8E+03 N	NO	1.8E+04 NM	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	6.7E+00	6.7E+00	MG_KG	CAA07-SS02-1008	1/7	0.36 - 1.2	6.7E+00	N/A	N/A	3.5E+01 C*	NO	1.2E+02 C	NO	BSL
	72-54-8	4,4'-DDD	3.3E-04 J	1.1E-02	MG_KG	CAA07-SS02-1008	2/7	0.0037 - 0.0042	1.1E-02	N/A	N/A	2.0E+00 C	NO	7.2E+00 C	NO	BSL
	72-55-9	4,4'-DDE	2.3E-04 J	6.0E-03	MG_KG	CAA07-SS02-1008	2/7	0.0037 - 0.0042	6.0E-03	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	1.7E-03 J	7.7E-03	MG_KG	CAA07-SS02-1008	2/7	0.0037 - 0.0042	7.7E-03	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	309-00-2	Aldrin	2.7E-04 J	2.7E-04 J	MG_KG	CAA07-SS02-1008	1/7	0.0019 - 0.0021	2.7E-04	N/A	N/A	2.9E-02 C*	NO	1.0E-01 C	NO	BSL
	60-57-1	Dieldrin	2.2E-04 J	2.2E-04 J	MG_KG	CAA07-SS02-1008	1/7	0.0037 - 0.0042	2.2E-04	N/A	N/A	3.0E-02 C	NO	1.1E-01 C	NO	BSL
	319-84-6	alpha-BHC	2.8E-04 J	2.8E-04 J	MG_KG	CAA07-SS01-1008	1/7	0.0019 - 0.0021	2.8E-04	N/A	N/A	7.7E-02 C	NO	2.7E-01 C	NO	BSL
	7429-90-5	**Aluminum**	**6.6E+03**	**1.3E+04**	**MG_KG**	**CAA07-SS05-1008**	**7/7**	**15 - 35**	**1.3E+04**	**1.2E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	**NO**	**ASL-Res**
	7440-36-0	Antimony	5.2E-01 L	5.2E-01 L	MG_KG	CAA07-SS03-1008	1/7	4.6 - 52	5.2E-01	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
	7440-38-2	**Arsenic**	**2.5E+00 L**	**2.3E+01 L**	**MG_KG**	**CAA07-SS02-1008**	**7/7**	**0.77 - 8.7**	**2.3E+01**	**6.4E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	3.6E+01	5.5E+01	MG_KG	CAA07-SS01-1008	7/7	15 - 35	5.5E+01	5.3E+01	YES	1.5E+03 N	NO	1.9E+04 NM	NO	BSL
	7440-41-7	Beryllium	2.7E-01 J	6.5E-01	MG_KG	CAA07-SS04-1008	7/7	0.38 - 0.87	6.5E-01	5.9E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	4.0E-02 J	2.5E+00 J	MG_KG	CAA07-SS03-1008	3/7	0.38 - 4.4	2.5E+00	1.5E+00	YES	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	4.1E+02 J	1.9E+03 J	MG_KG	CAA07-SS01-1008	7/7	380 - 870	1.9E+03	2.3E+03	NO	NA	N/A	N/A	N/A	BBK
	7440-47-3	**Chromium**	**7.7E+00 K**	**1.4E+02 K**	**MG_KG**	**CAA07-SS03-1008**	**7/7**	**0.77 - 8.7**	**1.4E+02**	**1.8E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	**Cobalt**	**2.5E+00 J**	**1.0E+01 J**	**MG_KG**	**CAA07-SS02-1008**	**7/7**	**3.8 - 44**	**1.0E+01**	**9.9E+00**	**YES**	**2.3E+00 N**	**YES**	**3.0E+01 N**	**NO**	**ASL-Res**
	7440-50-8	Copper	2.9E+00	7.7E+01	MG_KG	CAA07-SS02-1008	7/7	1.9 - 4.4	7.7E+01	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	**Iron**	**5.8E+03**	**2.1E+05**	**MG_KG**	**CAA07-SS02-1008**	**7/7**	**7.7 - 87**	**2.1E+05**	**2.0E+04**	**YES**	**5.5E+03 N**	**YES**	**7.2E+04 NM**	**YES**	**ASL-Res, ASL-Ind**
	7439-92-1	**Lead**	**9.8E+00**	**9.8E+02**	**MG_KG**	**CAA07-SS03-1008**	**7/7**	**0.77 - 8.7**	**9.8E+02**	1.7E+01	YES	4.0E+02 NL	YES	8.0E+02 NL	**YES**	**ASL-Res, ASL-Ind**
	7439-95-4	Magnesium	6.4E+02	9.9E+02 J	MG_KG	CAA07-SS05-1008	7/7	380 - 4400	9.9E+02	1.1E+03	NO	N/A	N/A	N/A	N/A	BBK
	7439-96-5	**Manganese**	**1.3E+02 L**	**9.2E+02 L**	**MG_KG**	**CAA07-SS02-1008**	**7/7**	**1.2 - 13**	**9.2E+02**	**3.2E+02**	**YES**	**1.8E+02 N**	**YES**	**2.3E+03 N**	**NO**	**ASL-Res**
	7440-02-0	Nickel	3.7E+00	3.3E+01 J	MG_KG	CAA07-SS02-1008	7/7	3.1 - 35	3.3E+01	9.5E+00	YES	1.5E+02 N	N/A	2.0E+03 N	NO	BSL
	7440-09-7	Potassium	4.2E+02	7.8E+02 J	MG_KG	CAA07-SS05-1008	7/7	380 - 870	7.8E+02	7.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7440-22-4	Silver	7.6E-01 J	2.6E+00 J	MG_KG	CAA07-SS02-1008	2/7	0.77 - 8.7	2.6E+00	2.1E+00	YES	3.9E+01 N	N/A	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	1.5E+01 L	3.0E+01 J	MG_KG	CAA07-SS03-1008	4/7	380 - 870	3.0E+01	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	1.2E+01	2.7E+01	MG_KG	CAA07-SS05-1008	7/7	3.8 - 44	2.7E+01	2.8E+01	NO	3.9E+01 N	YES	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	1.6E+01	8.4E+02	MG_KG	CAA07-SS03-1008	7/7	4.6 - 10	8.4E+02	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

Facilities, USEPA, July 14, 1994.

RSL value for Chromium(VI) used as surrogate for chromium.

RSL value for Mercury (inorganic salts) used as surrogate for mercury.

ND = Not detected

NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

[7] Rationale Codes

Selection Reason: Above Residential Soil Screening Levels (ASL-Res)
Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

TABLE 2.1a

Step 2 Surface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 7 - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	7 / 7	1.3E+04	CAA07-SS05-1008	7.7E+04	1	0.2	NA	Developmental, Neurological
Arsenic	7 / 7	2.3E+01 L	CAA07-SS02-1008	3.9E-01	1E-06	NA	6E-05	NA
Chromium	7 / 7	1.4E+02 K	CAA07-SS03-1008	2.9E-01	1E-06	NA	5E-04	NA
Cobalt	7 / 7	1.0E+01 J	CAA07-SS02-1008	2.3E+01	1	0.4	NA	Thyroid
Iron	7 / 7	2.1E+05	CAA07-SS02-1008	5.5E+04	1	4	NA	Gastrointestinal
Lead	7 / 7	9.8E+02	CAA07-SS03-1008	NA	NA	NA	NA	NA
Manganese	7 / 7	9.2E+02 L	CAA07-SS02-1008	1.8E+03	1	0.5	NA	CNS
Cumulative Corresponding Hazard Index[c]						**5**		
Cumulative Corresponding Cancer Risk[d]							**5E-04**	

Total Developmental HI =	0.2
Total CNS/Neurological HI =	**0.7**
Total Thyroid HI =	0.4
Total Gastrointestinal HI =	**4**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

K = Biased High

L = Biased Low

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.1b

Step 3 Surface Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 7 - Surface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)									
Aluminum	7 / 7	9.7E+03	95% Stud-t	5	7.7E+04	1	0.1	NA	Developmental, Neurological
Arsenic	7 / 7	1.4E+01	G-App	1, 3, 4	3.9E-01	1E-06	NA	4E-05	NA
Chromium	7 / 7	9.9E+01	G-App	3, 4	2.9E-01	1E-06	NA	3E-04	NA
Iron	7 / 7	1.6E+05	G-App	1, 3, 4	5.5E+04	1	3	NA	Gastrointestinal
Manganese	7 / 7	6.1E+02	G-App	1, 3, 4	1.8E+03	1	0.3	NA	CNS
Cumulative Corresponding Hazard Index[c]							**3**		
Cumulative Corresponding Cancer Risk[d]								**4E-04**	

CNS = central nervous system

Total Development HI =	0.1
Total CNS/Neurological HI =	0.5
Total Gastrointestinal HI =	**3**

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[u] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

HI = Hazard Index

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Approximate Gamma UCL (G-App); 95% Student's-T test UCL (95% Stud-t).

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Maximum detected concentration because sample set less than 5 samples.

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity Value [5]	COPC Flag	Screening [3] Toxicity Value [6]	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Subsurface Soil	108-95-2	Phenol	2.7E-01 J	2.7E-01 J	MG_KG	CAA07-SB06-1008	1/9	0.34 - 0.38	2.7E-01	N/A	N/A	1.8E+03 N	NO	1.8E+04 NM	NO	BSL
AOC 7	117-81-7	bis(2-Ethylhexyl)phthalate	7.4E+00	7.4E+00	MG_KG	CAA07-SB06-1008	1/9	0.34 - 1.4	7.4E+00	N/A	N/A	3.5E+01 C*	NO	1.2E+02 C	NO	BSL
	50-29-3	4,4'-DDT	7.5E-04 J	9.7E-04 J	MG_KG	CAA07-SB03-1008	2/9	0.0034 - 0.0042	1.3E-03	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	60-57-1	Dieldrin	2.9E-04 J	2.9E-04 J	MG_KG	CAA07-SB03-1008	1/9	0.0034 - 0.0042	2.9E-04	N/A	N/A	3.0E-02 C	NO	1.1E-01 C	NO	BSL
	72-20-8	Endrin	3.3E-04 J	4.0E-04 J	MG_KG	CAA07-SB01-1008	2/9	0.0034 - 0.0042	4.0E-04	N/A	N/A	1.8E+00 N	NO	1.8E+01 N	NO	BSL
	76-44-8	Heptachlor	2.5E-04 J	2.5E-04 J	MG_KG	CAA07-SB03-1008	1/9	0.0017 - 0.0021	2.5E-04	N/A	N/A	1.1E-01 C	NO	3.8E-01 C	NO	BSL
	556-88-7	Nitroguanidine	6.3E-02 J	6.3E-02 J	MG_KG	CAA07-SB04-1008	1/10	0.12 - 0.13	6.3E-02	N/A	N/A	6.1E+02 N	NO	6.2E+03 N	NO	BSL
	7429-90-5	**Aluminum**	**5.9E+03**	**2.3E+04**	**MG_KG**	**CAA07-SB05-1008**	**9/9**	**13 - 32**	**2.3E+04**	**1.3E+04**	**YES**	**7.7E+03 N**	**YES**	**9.9E+04 NM**	NO	**ASL-Res**
	7440-38-2	**Arsenic**	**2.3E+00 L**	**8.1E+00 L**	**MG_KG**	**CAA07-SB05-1008**	**9/9**	**0.66 - 1.6**	**8.1E+00**	**5.5E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	8.2E+00 J	5.1E+01	MG_KG	CAA07-SB04-1008	9/9	13 - 32	5.1E+01	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	2.8E-01 J	7.4E-01	MG_KG	CAA07-SB04-1008	9/9	0.33 - 0.49	7.4E-01	5.2E-01	YES	1.6E+01 N	NO	2.0E+02 N	NO	BSL
	7440-43-9	Cadmium	4.0E-02 J	6.3E-01	MG_KG	CAA07-SB03P-1008	2/9	0.33 - 0.49	6.3E-01	ND	YES	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	6.2E+01 J	1.0E+03 J	MG_KG	CAA07-SB01-1008	9/9	330 - 490	1.0E+03	2.4E+03	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	Chromium	8.0E+00	2.9E+01	MG_KG	CAA07-SB05-1008	9/9	0.66 - 1.6	2.9E+01	3.4E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	6.1E-01 J	5.2E+00 J	MG_KG	CAA07-SB05-1008	9/9	3.3 - 4.9	5.2E+00	5.2E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	1.6E+00 J	5.1E+00	MG_KG	CAA07-SB03P-1008	8/9	1.7 - 2.5	5.1E+00	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	5.7E+03	3.0E+04	MG_KG	CAA07-SB05-1008	9/9	6.6 - 16	3.0E+04	3.2E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	3.5E+00	1.8E+02 J	MG_KG	CAA07-SB03-1008	9/9	0.66 - 1.6	1.8E+02	8.8E+00	YES	4.0E+02 NL	NO	8.0E+02 NL	NO	BSL
	7439-95-4	Magnesium	6.0E+02 J	1.5E+03 J	MG_KG	CAA07-SB05-1008	9/9	330 - 490	1.5E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**1.1E+01 L**	**2.7E+02 L**	**MG_KG**	**CAA07-SB04-1008**	**9/9**	**1 - 2.4**	**2.7E+02**	**1.8E+02**	**YES**	**1.8E+02 N**	**YES**	**2.3E+03 N**	**NO**	**ASL-Res**
	7439-97-6	Mercury	4.0E-02 J	4.0E-02 J	MG_KG	CAA07-SB05-1008	1/9	0.1 - 0.12	4.0E-02	1.4E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	1.8E+00 J	7.6E+00 J	MG_KG	CAA07-SB05-1008	9/9	2.6 - 3.9	7.6E+00	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	3.4E+02 J	2.0E+03	MG_KG	CAA07-SBTP05-1008	9/9	330 - 490	2.0E+03	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	4.6E-01 L	6.4E-01 J	MG_KG	CAA07-SB01-1008	2/9	2.3 - 3.4	6.4E-01	6.4E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-22-4	Silver	1.1E-01 J	1.1E-01 J	MG_KG	CAA07-SB03P-1008	1/9	0.66 - 0.98	1.1E-01	1.1E+00	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	1.5E+01 J	3.8E+01 J	MG_KG	CAA07-SB01-1008	4/9	330 - 490	3.8E+01	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	9.0E+00	4.4E+01	MG_KG	CAA07-SB05-1008	9/9	3.3 - 4.9	4.4E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	7.6E+00	2.8E+02	MG_KG	CAA07-SB03P-1008	9/9	4 - 9.6	2.8E+02	2.8E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown surface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
RSL value for endrin used as surrogate for endrin aldehyde.

[7] Rationale Codes

Selection Reason:	Above Residential Soil Screening Levels (ASL-Res)
	Above Industrial Soil Screening Levels (ASL-Ind)
Deletion Reason:	Below Background (BBK)
	Below Screening Level (BSL)
	No Toxicity Information (NTX)
	Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected
NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

TABLE 2.2a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 7 - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Metals (mg/kg)								
Aluminum	9 / 9	2.3E+04	CAA07-SB05-1008	7.7E+04	1	0.3	NA	Developmental, Neurological
Arsenic	9 / 9	8.1E+00 L	CAA07-SB05-1008	3.9E-01	1E-06	NA	2E-05	NA
Manganese	9 / 9	2.7E+02 L	CAA07-SB04-1008	1.8E+03	1	0.2	NA	CNS
Cumulative Corresponding Hazard Index[c]						**0.4**		
Cumulative Corresponding Cancer Risk[d]							**2E-05**	
						Total Developmental HI =		0.3
						Total CNS/Neurological HI =		0.4

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

L = Biased Low

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Deep Subsurface Soil AOC 7	78-93-3	2-Butanone	2.0E-03 J	2.0E-03 J	MG_KG	CAA07-SB02-1008	1/1	0.012	2.0E-03	N/A	N/A	2.8E+03 NS	NO	2.0E+04 NMS	NO	BSL
	72-54-8	4,4'-DDD	1.4E-03 J	1.4E-03 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	1.4E-03	N/A	N/A	2.0E+00 C	NO	7.2E+00 C	NO	BSL
	72-55-9	4,4'-DDE	4.1E-04 J	4.1E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	4.1E-04	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	1.3E-03 J	1.3E-03 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	1.3E-03	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	309-00-2	Aldrin	4.7E-04 J	4.7E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	4.7E-04	N/A	N/A	2.9E-02 C*	NO	1.0E-01 C	NO	BSL
	60-57-1	Dieldrin	5.5E-04 J	5.5E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	5.5E-04	N/A	N/A	3.0E-02 C	NO	1.1E-01 C	NO	BSL
	72-20-8	Endrin	6.0E-04 J	6.0E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	6.0E-04	N/A	N/A	1.8E+00 N	NO	1.8E+01 N	NO	BSL
	7421-93-4	Endrin aldehyde	7.3E-04 J	7.3E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0042	7.3E-04	N/A	N/A	1.8E+00 N	NO	1.8E+01 N	NO	BSL
	76-44-8	Heptachlor	3.9E-04 J	3.9E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0021	3.9E-04	N/A	N/A	1.1E-01 C	NO	3.8E-01 C	NO	BSL
	58-89-9	gamma-BHC (Lindane)	2.9E-04 J	2.9E-04 J	MG_KG	CAA07-SB02-1008	1/1	0.0021	2.9E-04	N/A	N/A	5.2E-01 C*	NO	2.1E+00 C	NO	BSL
	7429-90-5	Aluminum	6.8E+03	6.8E+03	MG_KG	CAA07-SB02-1008	1/1	32	6.8E+03	1.3E+04	NO	7.7E+03 N	N/A	9.9E+04 NM	N/A	BBK
	7440-38-2	Arsenic	4.3E+00 L	4.3E+00 L	MG_KG	CAA07-SB02-1008	1/1	1.6	4.3E+00	5.5E+00	NO	3.9E-01 C*	N/A	1.6E+00 C	N/A	BBK
	7440-39-3	Barium	7.7E+00 J	7.7E+00 J	MG_KG	CAA07-SB02-1008	1/1	32	7.7E+00	8.5E+01	NO	1.5E+03 N	N/A	1.9E+04 NM	N/A	BBK
	7440-41-7	Beryllium	4.8E-01	4.8E-01	MG_KG	CAA07-SB02-1008	1/1	0.49	4.8E-01	5.2E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	6.0E-02 J	6.0E-02 J	MG_KG	CAA07-SB02-1008	1/1	0.49	6.0E-02	ND	YES	7.0E+00 N	NO	8.0E+01 N	NO	BSL
	7440-70-2	Calcium	1.0E+02 J	1.0E+02 J	MG_KG	CAA07-SB02-1008	1/1	490	1.0E+02	2.4E+03	NO	N/A	N/A	N/A	N/A	BBK
	7440-47-3	Chromium	2.3E+01 K	2.3E+01 K	MG_KG	CAA07-SB02-1008	1/1	1.6	2.3E+01	3.4E+01	NO	2.9E-01 C	N/A	5.6E+00 C	N/A	BBK
	7440-48-4	Cobalt	2.1E+00 J	2.1E+00 J	MG_KG	CAA07-SB02-1008	1/1	4.9	2.1E+00	5.2E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	5.4E+00 J	5.4E+00	MG_KG	CAA07-SB02-1008	1/1	2.5	5.4E+00	3.2E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	1.6E+04	1.6E+04	MG_KG	CAA07-SB02-1008	1/1	16	1.6E+04	3.2E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	6.6E+00	6.6E+00 J	MG_KG	CAA07-SB02-1008	1/1	1.6	6.6E+00	8.8E+00	NO	4.0E+02 NL	N/A	8.0E+02 NL	N/A	BBK
	7439-95-4	Magnesium	1.7E+03 J	1.7E+03	MG_KG	CAA07-SB02-1008	1/1	490	1.7E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	3.1E+01 L	3.1E+01 L	MG_KG	CAA07-SB02-1008	1/1	2.4	3.1E+01	1.8E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	7.0E-02 L	7.0E-02 L	MG_KG	CAA07-SB02-1008	1/1	0.12	7.0E-02	1.4E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	7.9E+00	7.9E+00	MG_KG	CAA07-SB02-1008	1/1	3.9	7.9E+00	1.8E+01	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	2.5E+03	2.5E+03	MG_KG	CAA07-SB02-1008	1/1	490	2.5E+03	9.0E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	4.2E-01 J	4.2E-01 J	MG_KG	CAA07-SB02-1008	1/1	3.4	4.2E-01	6.4E-01	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-22-4	Silver	1.2E-01 J	1.2E-01 J	MG_KG	CAA07-SB02-1008	1/1	0.98	1.2E-01	1.1E+00	NO	3.9E+01 N	N/A	5.1E+02 N	N/A	BBK
	7440-23-5	Sodium	5.4E+02 J	5.4E+02	MG_KG	CAA07-SB02-1008	1/1	490	5.4E+02	8.1E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-62-2	Vanadium	3.5E+01	3.5E+01	MG_KG	CAA07-SB02-1008	1/1	4.9	3.5E+01	4.8E+01	NO	3.9E+01 N	N/A	5.2E+02 N	N/A	BBK
	7440-66-6	Zinc	2.4E+01	2.4E+01	MG_KG	CAA07-SB02-1008	1/1	9.6	2.4E+01	2.8E+01	NO	2.3E+03 N	N/A	3.1E+04 NM	N/A	BBK

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex/Yorktown surface soil background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
RSL value for endrin used as surrogate for endrin aldehyde.

[7] Rationale Codes

Selection Reason:	Above Residential Soil Screening Levels (ASL-Res)
	Above Industrial Soil Screening Levels (ASL-Ind)
Deletion Reason:	Below Background (BBK)
	Below Screening Level (BSL)
	No Toxicity Information (NTX)
	Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected
NL = Noncarcinogenic lead residential soil RSL not adjusted by dividing by 10.

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 7

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Groundwater	67-64-1	Acetone	2.0E+00 J	2.0E+00 J	UG_L	CAA07-DW01-1008 CAA07-DW03P-1008	2/4	10 - 10	2.0E+00	N/A	N/A	2.2E+03 N	NO	N/A	N/A	BSL
AOC 7	**100-41-4**	**Ethylbenzene**	**2.0E+00 J**	**2.0E+00 J**	**UG_L**	**CAA07-DW01-1008**	**1/4**	**10 - 10**	**2.0E+00**	N/A	**N/A**	**1.5E+00 C**	**YES**	**7.0E+02**	**NO**	**ASL-RSL**
	108-88-3	Toluene	1.0E+00 J	1.0E+00 J	UG_L	CAA07-DW01-1008	1/4	10 - 10	1.0E+00	N/A	N/A	2.3E+02 N	NO	1.0E+03	NO	BSL
	7429-90-5	**Aluminum**	**2.5E+02**	**3.9E+04**	**UG_L**	**CAA07-DW01-1008**	**4/4**	**200 - 200**	**3.9E+04**	**2.2E+03**	**YES**	**3.7E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-36-0	Antimony	1.0E+00 J	1.4E+01 J	UG_L	CAA07-DW01-1008	3/4	60 - 60	1.4E+01	1.9E+01	NO	1.5E+00 N	N/A	6.0E+00	N/A	BBK
	7440-38-2	**Arsenic**	**1.3E+01**	**7.9E+01**	**UG_L**	**CAA07-DW01-1008**	**2/4**	**10 - 10**	**7.9E+01**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	2.8E+01 J	1.1E+02 J	UG_L	CAA07-DW01-1008	4/4	200 - 200	1.1E+02	1.2E+02	NO	7.3E+02 N	N/A	2.0E+03	N/A	BBK
	7440-41-7	Beryllium	1.8E-01 J	2.6E+00 J	UG_L	CAA07-DW01-1008	2/4	5 - 5	2.6E+00	2.5E+00	YES	7.3E+00 N	NO	4.0E+00	NO	BSL
	7440-43-9	Cadmium	1.4E+00 J	1.5E+00 J	UG_L	CAA07-DW03-1008	3/4	5 - 5	1.5E+00	6.1E-01	YES	1.8E+00 N	NO	5.0E+00	NO	BSL
	7440-70-2	Calcium	1.1E+05	7.9E+05	UG_L	CAA07-DW01-1008	4/4	5000 - 5000	7.9E+05	1.6E+05	YES	N/A	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**1.4E+00 J**	**1.7E+02**	**UG_L**	**CAA07-DW01-1008**	**4/4**	**10 - 10**	**1.7E+02**	**1.5E+01**	**YES**	**4.3E-02 C**	**YES**	**1.0E+02**	**YES**	**ASL-RSL, ASL-MCL**
	7440-48-4	Cobalt	9.6E-01 J	1.5E+01 J	UG_L	CAA07-DW01-1008	4/4	50 - 50	1.5E+01	2.1E+01	NO	1.1E+00 N	N/A	N/A	N/A	BBK
	7440-50-8	Copper	1.4E+00 J	4.5E+01	UG_L	CAA07-DW01-1008	4/4	25 - 25	4.5E+01	1.2E+01	YES	1.5E+02 N	NO	1.3E+03	NO	BSL
	7439-89-6	**Iron**	**5.5E+02**	**1.2E+05**	**UG_L**	**CAA07-DW01-1008**	**4/4**	**100 - 100**	**1.2E+05**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	**Lead**	**3.1E+01**	**3.1E+01**	**UG_L**	**CAA07-DW01-1008**	**1/4**	**10 - 10**	**3.1E+01**	**2.1E+01**	**YES**	**N/A**	**N/A**	**1.5E+01**	**YES**	**ASL-MCL**
	7439-95-4	Magnesium	2.6E+03 J	1.4E+04	UG_L	CAA07-DW01-1008	4/4	5000 - 5000	1.4E+04	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**1.7E+01**	**1.8E+02**	**UG_L**	**CAA07-DW01-1008**	**4/4**	**15 - 15**	**1.8E+02**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-02-0	**Nickel**	**5.8E+00 J**	**8.3E+01**	**UG_L**	**CAA07-DW01-1008**	**4/4**	**40 - 40**	**8.3E+01**	**1.1E+01**	**YES**	**7.3E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-09-7	Potassium	1.7E+03 J	1.6E+04	UG_L	CAA07-DW01-1008	4/4	5000 - 5000	1.6E+04	3.5E+03	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	**Selenium**	**1.3E+00 J**	**2.7E+01 J**	**UG_L**	**CAA07-DW01-1008**	**2/4**	**35 - 35**	**2.7E+01**	**ND**	**YES**	**1.8E+01 N**	**YES**	**5.0E+01**	**NO**	**ASL-RSL**
	7440-23-5	Sodium	5.8E+03	1.5E+04	UG_L	CAA07-DW01-1008	4/4	5000 - 5000	1.5E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-62-2	**Vanadium**	**7.5E-01 J**	**2.0E+02**	**UG_L**	**CAA07-DW01-1008**	**4/4**	**50 - 50**	**2.0E+02**	**2.6E+01**	**YES**	**1.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-66-6	Zinc	4.3E+00 J	1.6E+02	UG_L	CAA07-DW01-1008	4/4	60 - 60	1.6E+02	4.5E+00	YES	1.1E+03 N	NO	N/A	N/A	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concentrations were then compared to RSLs and MCLs.

[4] Background values from CAX groundwater background; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs. RSL value for Chromium VI (chromic acid mists) used as surrogate for chromium.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009). Available: http://water.epa.gov/drink/contaminants/index.cfm

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
C = Carcinogenic
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable
ND = Not detected

TABLE 2.4a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 7 - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Volatile Organic Compounds (ug/L)								
Ethylbenzene	1 / 4	2.0E+00 J	CAA07-DW01-1008	1.5E+00	1E-06	NA	1E-06	NA
Metals (ug/L)								
Aluminum	4 / 4	3.9E+04	CAA07-DW01-1008	3.7E+04	1	1	NA	Developmental, Neurological
Arsenic	2 / 4	7.9E+01	CAA07-DW01-1008	4.5E-02	1E-06	NA	2E-03	NA
Chromium	4 / 4	1.7E+02	CAA07-DW01-1008	4.3E-02	1E-06	NA	4E-03	NA
Iron	4 / 4	1.2E+05	CAA07-DW01-1008	2.6E+04	1	5	NA	Gastrointestinal
Lead	1 / 4	3.1E+01	CAA07-DW01-1008	NA	NA	NA	NA	NA
Manganese	4 / 4	1.8E+02	CAA07-DW01-1008	8.8E+02	1	0.2	NA	CNS
Nickel	4 / 4	8.3E+01	CAA07-DW01-1008	7.3E+02	1	0.1	NA	Decreased Body Weight, Decreased Organ Weight
Selenium	2 / 4	2.7E+01 J	CAA07-DW01-1008	1.8E+02	1	0.1	NA	Whole Body
Vanadium	4 / 4	2.0E+02	CAA07-DW01-1008	1.8E+02	1	1	NA	Kidney
Cumulative Corresponding Hazard Index[c]						**7**		
Cumulative Corresponding Cancer Risk[d]							**6E-03**	

Total Developmental HI =	**1**
Total CNS/Neurological HI =	**1**
Total Gastrointestinal HI =	**5**
Total Decreased Organ Weight HI =	0.1
Total Whole Body HI =	0.3
Total Kidney HI =	**1**

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

µg/L = micrograms per liter

NA = Not available/not applicable

Attachment A.5—AOC 8

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 8

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Surface Soil AOC 8	67-64-1	Acetone	3.6E-02 J	3.6E-02 J	MG_KG	CAA08-SS02-1008	1/9	0.01 - 0.012	3.6E-02	N/A	N/A	6.1E+03 N	NO	6.3E+04 NMS	NO	BSL
	100-52-7	Benzaldehyde	1.8E-01 J	1.8E-01 J	MG_KG	CAA08-SS04-1008	1/9	0.36 - 0.41	1.8E-01	N/A	N/A	7.8E+02 NS	NO	1.0E+04 NMS	NO	BSL
	205-99-2	**Benzo(b)fluoranthene**	**2.7E-01 J**	**2.9E-01 J**	**MG_KG**	**CAA08-SS04-1008**	**2/9**	**0.36 - 0.41**	**2.9E-01**	N/A	**N/A**	**1.5E-01 C**	**YES**	**2.1E+00 C**	**NO**	**ASL-Res**
	207-08-9	Benzo(k)fluoranthene	2.1E-01 J	2.1E-01 J	MG_KG	CAA08-SS04-1008 CAA08-SS08-1008	2/9	0.36 - 0.41	2.1E-01	N/A	N/A	1.5E+00 C	NO	2.1E+01 C	NO	BSL
	218-01-9	Chrysene	2.1E-01 J	2.1E-01 J	MG_KG	CAA08-SS04-1008	1/9	0.36 - 0.41	2.1E-01	N/A	N/A	1.5E+01 C	NO	2.1E+02 C	NO	BSL
	206-44-0	Fluoranthene	2.6E-01 J	2.6E-01 J	MG_KG	CAA08-SS04-1008	1/9	0.36 - 0.41	2.6E-01	N/A	N/A	2.3E+02 N	NO	2.2E+03 N	NO	BSL
	129-00-0	Pyrene	2.5E-01 J	2.5E-01 J	MG_KG	CAA08-SS04-1008	1/9	0.36 - 0.41	2.5E-01	N/A	N/A	1.7E+02 N	NO	1.7E+03 N	NO	BSL
	72-54-8	4,4'-DDD	2.3E-04 J	2.4E-03 J	MG_KG	CAA08-SS04-1008	4/9	0.0036 - 0.0073	2.4E-03	N/A	N/A	2.0E+00 C	NO	7.2E+00 C	NO	BSL
	72-55-9	4,4'-DDE	3.4E-04 J	1.7E-02	MG_KG	CAA08-SS05-1008	6/9	0.0036 - 0.0073	1.7E-02	N/A	N/A	1.4E+00 C	NO	5.1E+00 C	NO	BSL
	50-29-3	4,4'-DDT	4.4E-04 J	1.4E-02	MG_KG	CAA08-SS05-1008	5/9	0.0036 - 0.0073	1.4E-02	N/A	N/A	1.7E+00 C*	NO	7.0E+00 C*	NO	BSL
	11096-82-5	**Aroclor-1260**	**1.8E-01**	**4.2E-01**	**MG_KG**	**CAA08-SS04-1008**	**3/9**	**0.036 - 0.073**	**4.2E-01**	N/A	**N/A**	**2.2E-01 C**	**YES**	**7.4E-01 C**	**NO**	**ASL-Res**
	60-57-1	Dieldrin	2.9E-04 J	3.4E-04 J	MG_KG	CAA08-SS03-1008	2/9	0.0036 - 0.0073	3.4E-04	N/A	N/A	3.0E-02 C	NO	1.1E-01 C	NO	BSL
	7421-93-4	Endrin aldehyde	3.3E-04 J	2.1E-02 J	MG_KG	CAA08-SS04-1008	5/9	0.0036 - 0.0073	2.1E-02	N/A	N/A	1.8E+00 N	NO	1.8E+01 N	NO	BSL
	1024-57-3	Heptachlor epoxide	7.6E-04 J	7.6E-04 J	MG_KG	CAA08-SS04-1008	1/9	0.0018 - 0.0036	7.6E-04	N/A	N/A	5.3E-02 C*	NO	1.9E-01 C*	NO	BSL
	5103-74-2	gamma-Chlordane	8.1E-04 J	8.1E-04 J	MG_KG	CAA08-SS04-1008	1/9	0.0018 - 0.0036	8.1E-04	N/A	N/A	1.6E+00 C*	NO	6.5E+00 C*	NO	BSL
	7429-90-5	Aluminum	3.9E+03	1.2E+04	MG_KG	CAA08-SS04-1008	9/9	16 - 22	1.2E+04	1.2E+04	NO	7.7E+03 N	N/A	9.9E+04 NM	N/A	BBK
	7440-36-0	Antimony	7.1E-01 L	1.7E+00 L	MG_KG	CAA08-SS04-1008	2/3	4.8 - 5.7	1.7E+00	1.1E+01	NO	3.1E+00 N	N/A	4.1E+01 N	N/A	BBK
	7440-38-2	**Arsenic**	**2.4E+00 K**	**1.5E+01 K**	**MG_KG**	**CAA08-SS04-1008**	**9/9**	**0.81 - 1.1**	**1.5E+01**	**6.4E+00**	**YES**	**3.9E-01 C***	**YES**	**1.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	1.2E+01 J	6.9E+01	MG_KG	CAA08-SS04-1008	9/9	16 - 22	6.9E+01	5.3E+01	YES	1.5E+03 N	NO	1.9E+04 NM	NO	BSL
	7440-41-7	Beryllium	2.0E-01 J	5.5E-01	MG_KG	CAA08-SS04-1008	9/9	0.4 - 0.54	5.5E-01	5.9E-01	NO	1.6E+01 N	N/A	2.0E+02 N	N/A	BBK
	7440-43-9	Cadmium	8.0E-02 J	7.1E-01	MG_KG	CAA08-SS04-1008	8/9	0.4 - 0.54	7.1E-01	1.5E+00	NO	7.0E+00 N	N/A	8.0E+01 N	N/A	BBK
	7440-70-2	Calcium	4.0E+02 J	6.2E+03	MG_KG	CAA08-SS04-1008	9/9	400 - 540	6.2E+03	2.3E+03	YES	NA	NUT	N/A	NUT	NUT
	7440-47-3	**Chromium**	**7.7E+00**	**2.7E+01**	**MG_KG**	**CAA08-SS04-1008**	**9/9**	**0.81 - 1.1**	**2.7E+01**	**1.8E+01**	**YES**	**2.9E-01 C**	**YES**	**5.6E+00 C**	**YES**	**ASL-Res, ASL-Ind**
	7440-48-4	Cobalt	7.2E-01 J	3.3E+00 J	MG_KG	CAA08-SS07-1008	9/9	4 - 5.4	3.3E+00	9.9E+00	NO	2.3E+00 N	N/A	3.0E+01 N	N/A	BBK
	7440-50-8	Copper	2.0E+00 J	4.0E+01	MG_KG	CAA08-SS04-1008	9/9	2 - 2.7	4.0E+01	4.3E+00	YES	3.1E+02 N	NO	4.1E+03 N	NO	BSL
	7439-89-6	Iron	5.0E+03	1.6E+04	MG_KG	CAA08-SS04-1008	9/9	8.1 - 11	1.6E+04	2.0E+04	NO	5.5E+03 N	N/A	7.2E+04 NM	N/A	BBK
	7439-92-1	Lead	6.4E+00	6.1E+01	MG_KG	CAA08-SS04-1008	9/9	0.67 - 1	6.1E+01	1.7E+01	YES	4.0E+02 N	NO	8.0E+02 N	NO	BSL
	7439-95-4	Magnesium	5.7E+02	3.2E+03	MG_KG	CAA08-SS07-1008	9/9	400 - 540	3.2E+03	1.1E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	Manganese	2.3E+01 L	1.7E+02 L	MG_KG	CAA08-SS04-1008	9/9	1.2 - 1.6	1.7E+02	3.2E+02	NO	1.8E+02 N	N/A	2.3E+03 N	N/A	BBK
	7439-97-6	Mercury	4.0E-02 L	4.0E-02 L	MG_KG	CAA08-SS04-1008	1/9	0.084 - 0.13	4.0E-02	1.1E-01	NO	2.3E+00 N	N/A	3.1E+01 N	N/A	BBK
	7440-02-0	Nickel	1.7E+00 J	8.3E+00	MG_KG	CAA08-SS07-1008	9/9	3.2 - 4.3	8.3E+00	9.5E+00	NO	1.5E+02 N	N/A	2.0E+03 N	N/A	BBK
	7440-09-7	Potassium	3.8E+02	3.2E+03	MG_KG	CAA08-SS07-1008	9/9	400 - 540	3.2E+03	7.1E+02	YES	N/A	NUT	N/A	NUT	NUT
	7782-49-2	Selenium	6.0E-01 J	6.0E-01 J	MG_KG	CAA08-SS04-1008	1/9	2.8 - 3.8	6.0E-01	5.1E-01	YES	3.9E+01 N	NO	5.1E+02 N	NO	BSL
	7440-23-5	Sodium	1.9E+01 J	1.3E+02 J	MG_KG	CAA08-SS04-1008	9/9	400 - 540	1.3E+02	5.2E+02	NO	N/A	N/A	N/A	N/A	BBK
	7440-28-0	Thallium	6.0E-02 J	8.0E-02 J	MG_KG	CAA08-SS01-1008	2/9	1.7 - 2.5	8.0E-02	ND	YES	N/A	N/A	N/A	N/A	NTX
	7440-62-2	Vanadium	1.1E+01	2.9E+01	MG_KG	CAA08-SS07-1008	9/9	4 - 5.4	2.9E+01	2.8E+01	YES	3.9E+01 N	NO	5.2E+02 N	NO	BSL
	7440-66-6	Zinc	8.5E+00	1.6E+02	MG_KG	CAA08-SS04-1008	9/9	4.8 - 6.4	1.6E+02	2.7E+01	YES	2.3E+03 N	NO	3.1E+04 NM	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 8

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^{-6} for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
RSL value for endrin used as surrogate for endrin aldehyde.

[7] Rationale Codes

Selection Reason:	Above Residential Soil Screening Levels (ASL-Res)
	Above Industrial Soil Screening Levels (ASL-Ind)
Deletion Reason:	Below Background (BBK)
	Below Screening Level (BSL)
	No Toxicity Information (NTX)
	Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
S = concentration may exceed saturation concentration
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

TABLE 2.1a

Step 2 Surface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 8 - Surface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)								
Benzo(b)fluoranthene	2 / 9	2.9E-01 J	CAA08-SS04-1008	1.5E-01	1E-06	NA	2E-06	NA
Pesticides/PCBs (mg/kg)								
Aroclor-1260	3 / 9	4.2E-01	CAA08-SS04-1008	2.2E-01	1E-06	NA	2E-06	NA
Metals (mg/kg)								
Arsenic	9 / 9	1.5E+01 K	CAA08-SS04-1008	3.9E-01	1E-06	NA	4E-05	NA
Chromium	9 / 9	2.7E+01	CAA08-SS04-1008	2.9E-01	1E-06	NA	9E-05	NA
Cumulative Corresponding Hazard Index[c]						**0.0**		
Cumulative Corresponding Cancer Risk[d]							**1E-04**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

J = Estimated Value

K = Biased High

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.1b

Step 3 Surface Soil Screening - Risk Ratio, 95% UCL

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 8 - Surface Soil

Analyte	Detection Frequency	95% UCL		95% UCL Rationale	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Semivolatile Organic Compounds (mg/kg)									
Benzo(b)fluoranthene	2 / 9	2.9E-01	Max	5, 6	1.5E-01	1E-06	NA	2E-06	NA
Pesticides/PCBs (mg/kg)									
Aroclor-1260	3 / 9	2.3E-01	95% KM-t	1, 2	2.2E-01	1E-06	NA	1E-06	NA
Metals (mg/kg)									
Arsenic	9 / 9	1.1E+01	95% Cheb-m	1, 2, 3, 4	3.9E-01	1E-06	NA	3E-05	NA
Chromium	9 / 9	1.9E+01	95% Stud-t	1, 2, 3, 4	2.9E-01	1E-06	NA	7E-05	NA
Cumulative Corresponding Hazard Index[c]							**0.0**		
Cumulative Corresponding Cancer Risk[d]								**1E-04**	

[a] Corresponding Hazard Index equals 95% UCL divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals 95% UCL divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05,

Constituents selected as COPCs are indicated by shading.

mg/kg = milligrams per kilogram

NA = Not available/not applicable

ProUCL, Version 4.00.04 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. February 2009. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Maximum Detected Value (Max); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Student's-T test UCL (95% Stud-t); 95% Chebyshev (mean, std) UCL (95% Cheb-m)

UCL Rationale:

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

(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.

(3) Anderson-Darling Test indicates data are gamma distributed.

(4) Kolmogorov-Smirnov Test indicates data are gamma distributed.

(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).

(6) Max value used because 95% UCL greater than max.

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 8

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier		Maximum [1] Concentration Qualifier		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value		COPC Flag	Screening [3] Toxicity [6] Value		COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Subsurface Soil AOC 8	78-93-3	2-Butanone	2.0E-03	J	2.0E-03	J	MG_KG	CAA08-SB06-1008	1/9	0.01 - 0.012	2.0E-03	N/A	N/A	2.8E+03	NS	NO	2.0E+04	NMS	NO	BSL
	72-54-8	4,4'-DDD	1.3E-03	J	4.0E-03		MG_KG	CAA08-SB07-1008	2/9	0.0035 - 0.0072	4.0E-03	N/A	N/A	2.0E+00	C	NO	7.2E+00	C	NO	BSL
	72-55-9	4,4'-DDE	3.4E-04	J	7.8E-03		MG_KG	CAA08-SB07-1008	5/9	0.0035 - 0.0072	7.8E-03	N/A	N/A	1.4E+00	C	NO	5.1E+00	C	NO	BSL
	50-29-3	4,4'-DDT	4.8E-04	J	2.4E-02	J	MG_KG	CAA08-SB04-1008	5/9	0.0035 - 0.0072	2.4E-02	N/A	N/A	1.7E+00	C*	NO	7.0E+00	C*	NO	BSL
	11096-82-5	**Aroclor-1260**	**5.0E-01**	**J**	**5.0E-01**	**J**	**MG_KG**	**CAA08-SB04-1008**	**1/9**	**0.035 - 0.072**	**5.0E-01**	N/A	**N/A**	**2.2E-01**	**C**	**YES**	**7.4E-01**	**C**	**NO**	**ASL-Res**
	60-57-1	Dieldrin	3.5E-04	J	3.5E-04	J	MG_KG	CAA08-SB03-1008	1/9	0.0035 - 0.0072	3.5E-04	N/A	N/A	3.0E-02	C	NO	1.1E-01	C	NO	BSL
	72-20-8	Endrin	5.0E-04	J	5.0E-04	J	MG_KG	CAA08-SB06-1008	1/9	0.0035 - 0.0072	5.0E-04	N/A	N/A	1.8E+00	N	NO	1.8E+01	N	NO	BSL
	7421-93-4	Endrin aldehyde	3.6E-04	J	2.4E-02	J	MG_KG	CAA08-SB04-1008	4/9	0.0035 - 0.0072	2.4E-02	N/A	N/A	1.8E+00	N	NO	1.8E+01	N	NO	BSL
	1024-57-3	Heptachlor epoxide	1.7E-03	J	1.7E-03	J	MG_KG	CAA08-SB04-1008	1/9	0.0018 - 0.0036	1.7E-03	N/A	N/A	5.3E-02	C*	NO	1.9E-01	C*	NO	BSL
	319-84-6	alpha-BHC	8.1E-04	J	8.1E-04	J	MG_KG	CAA08-SB04-1008	1/9	0.0018 - 0.0036	8.1E-04	N/A	N/A	7.7E-02	C	NO	2.7E-01	C	NO	BSL
	7429-90-5	Aluminum	4.9E+03		9.8E+03		MG_KG	CAA08-SB01-1008	9/9	11 - 23	9.8E+03	1.3E+04	NO	7.7E+03	N	N/A	9.9E+04	NM	N/A	BBK
	7440-36-0	Antimony	3.3E-01	L	3.3E-01	L	MG_KG	CAA08-SB04-1008	1/3	3.3 - 6.1	3.3E-01	ND	YES	3.1E+00	N	NO	4.1E+01	N	NO	BSL
	7440-38-2	**Arsenic**	**2.1E+00**	**L**	**6.7E+00**	**K**	**MG_KG**	**CAA08-SB04-1008**	**9/9**	**0.54 - 1.2**	**6.7E+00**	**5.5E+00**	**YES**	**3.9E-01**	**C***	**YES**	**1.6E+00**	**C**	**YES**	**ASL-Res, ASL-Ind**
	7440-39-3	Barium	8.1E+00	J	4.7E+01		MG_KG	CAA08-SB09P-1008	9/9	11 - 23	4.7E+01	8.5E+01	NO	1.5E+03	N	N/A	1.9E+04	NM	N/A	BBK
	7440-41-7	Beryllium	2.8E-01	J	4.6E-01	J	MG_KG	CAA08-SB04-1008	9/9	0.27 - 0.58	4.6E-01	5.2E-01	NO	1.6E+01	N	N/A	2.0E+02	N	N/A	BBK
	7440-43-9	Cadmium	6.0E-02	J	4.5E-01	J	MG_KG	CAA08-SB04-1008	5/9	0.27 - 0.58	4.5E-01	ND	YES	7.0E+00	N	NO	8.0E+01	N	NO	BSL
	7440-70-2	Calcium	3.3E+02	J	1.1E+04		MG_KG	CAA08-SB05-1008	9/9	270 - 580	1.1E+04	2.4E+03	YES	N/A		NUT	N/A		NUT	NUT
	7440-47-3	Chromium	7.6E+00	K	2.6E+01	K	MG_KG	CAA08-SB07-1008	9/9	0.54 - 1.2	2.6E+01	3.4E+01	NO	2.9E-01	C	N/A	5.6E+00	C	N/A	BBK
	7440-48-4	Cobalt	6.3E-01	J	2.7E+00	J	MG_KG	CAA08-SB06P-1008	9/9	2.7 - 5.8	2.7E+00	5.2E+00	NO	2.3E+00	N	N/A	3.0E+01	N	N/A	BBK
	7440-50-8	Copper	1.6E+00		1.3E+01		MG_KG	CAA08-SB04-1008	9/9	1.4 - 2.9	1.3E+01	3.2E+00	YES	3.1E+02	N	NO	4.1E+03	N	NO	BSL
	7439-89-6	Iron	4.7E+03		1.0E+04		MG_KG	CAA08-SB04-1008; CAA08-SB07-1008	9/9	5.4 - 12	1.0E+04	3.2E+04	NO	5.5E+03	N	N/A	7.2E+04	NM	N/A	BBK
	7439-92-1	Lead	2.7E+00		4.3E+01		MG_KG	CAA08-SB04-1008	9/9	0.54 - 1	4.3E+01	8.8E+00	YES	4.0E+02	N	N/A	8.0E+02	N	NO	NTX
	7439-95-4	Magnesium	5.1E+02		1.8E+03		MG_KG	CAA08-SB04-1008	9/9	270 - 580	1.8E+03	1.1E+03	YES	NA		NUT	N/A		NUT	NUT
	7439-96-5	Manganese	1.3E+01	L	1.1E+02	L	MG_KG	CAA08-SB04-1008	9/9	0.82 - 1.7	1.1E+02	1.8E+02	NO	1.8E+02	N	N/A	2.3E+03	N	N/A	BBK
	7439-97-6	Mercury	4.0E-02	L	4.0E-02	L	MG_KG	CAA08-SB04-1008	1/9	0.088 - 0.13	4.0E-02	1.4E-01	NO	2.3E+00	N	N/A	3.1E+01	N	N/A	BBK
	7440-02-0	Nickel	2.0E+00	J	9.3E+00		MG_KG	CAA08-SB07-1008	9/9	2.2 - 4.6	9.3E+00	1.8E+01	NO	1.5E+02	N	N/A	2.0E+03	N	N/A	BBK
	7440-09-7	Potassium	3.4E+02		1.7E+03		MG_KG	CAA08-SB02-1008	9/9	270 - 580	1.7E+03	9.0E+02	YES	N/A		NUT	N/A		NUT	NUT
	7782-49-2	Selenium	2.9E-01	J	2.9E-01	J	MG_KG	CAA08-SB05-1008	1/9	1.9 - 4	2.9E-01	6.4E-01	NO	3.9E+01	N	N/A	5.1E+02	N	N/A	BBK
	7440-22-4	Silver	4.0E-02	J	4.0E-02	J	MG_KG	CAA08-SB01-1008	1/9	0.54 - 1.2	4.0E-02	1.1E+00	NO	3.9E+01	N	N/A	5.1E+02	N	N/A	BBK
	7440-23-5	Sodium	1.7E+01	J	1.6E+02	J	MG_KG	CAA08-SB05-1008	9/9	270 - 580	1.6E+02	8.1E+02	NO	N/A		N/A	N/A		N/A	BBK
	7440-62-2	Vanadium	1.1E+01		2.3E+01		MG_KG	CAA08-SB07-1008	9/9	2.7 - 5.8	2.3E+01	4.8E+01	NO	3.9E+01	N	N/A	5.2E+02	N	N/A	BBK
	7440-66-6	Zinc	7.8E+00		8.9E+01		MG_KG	CAA08-SB04-1008	9/9	3.3 - 6.9	8.9E+01	2.8E+01	YES	2.3E+03	N	NO	3.1E+04	NM	NO	BSL

Table 2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 8

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

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

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] Toxicity [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs.

[4] Background values from Cheatham Annex surface soil; values represent the 95% UTL.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Residential Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml

[6] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Industrial Soil RSLs (based on 10^6 for carcinogens and HQ of 0.1 for noncarcinogens). Available Online: http://epa-prgs.ornl.gov/chemicals/index.shtml
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RSL value for Chromium(VI) used as surrogate for chromium.
RSL value for Manganese (water) used as surrogate for manganese.
RSL value for Mercury (inorganic salts) used as surrogate for mercury.
RSL value for endrin used as surrogate for endrin aldehyde.

[7] Rationale Codes

Selection Reason:
- Above Residential Soil Screening Levels (ASL-Res)
- Above Industrial Soil Screening Levels (ASL-Ind)

Deletion Reason:
- Below Background (BBK)
- Below Screening Level (BSL)
- No Toxicity Information (NTX)
- Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
C* = where: N SL < 100X C SL
N = Noncarcinogenic
S = concentration may exceed saturation concentration
RSL = Regional Screening Levels
N/A = Not available or Not applicable
M = Concentration may exceed ceiling limit
ND = Not detected

TABLE 2.2a

Step 2 Subsurface Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 8 - Subsurface Soil

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Residential Soil RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Pesticides/PCBs (mg/kg)								
Aroclor-1260	1 / 9	5.0E-01 J	CAA08-SB04-1008	2.2E-01	1E-06	NA	2E-06	NA
Metals (mg/kg)								
Arsenic	9 / 9	6.7E+00 K	CAA08-SB04-1008	3.9E-01	1E-06	NA	2E-05	NA
Cumulative Corresponding Hazard Index[c]						**NA**		
Cumulative Corresponding Cancer Risk[d]							**2E-05**	

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

COPC = Constituent of Potential Concern

J = Estimated Value

mg/kg = milligrams per kilogram

NA = Not available/not applicable

Table 2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN - AOC 8

Cheatham Annex Areas of Concern, Williamsburg, Virginia

Site Investigation Report

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Screening [3] Background [4] Value	COPC Flag	Screening [3] Toxicity [5] Value	COPC Flag	Screening [3] MCL [6] Value	COPC Flag	Rationale for [7] Contaminant Deletion or Selection
Groundwater	**127-18-4**	**Tetrachloroethene**	**7.0E+00 J**	**7.0E+00 J**	**UG_L**	**CAA08-DW02-1008**	**1/4**	**10 - 10**	**7.0E+00**	**N/A**	**N/A**	**1.1E-01 C**	**YES**	**5.0E+00**	**YES**	**ASL-RSL, ASL-MCL**
	7429-90-5	Aluminum	8.4E+02	1.9E+03	UG_L	CAA08-DW02-1008	2/4	200 - 200	1.9E+03	2.2E+03	NO	3.7E+03 N	N/A	N/A	N/A	BBK
	7440-38-2	**Arsenic**	**1.5E+01**	**1.5E+01**	**UG_L**	**CAA08-DW04-1008**	**1/4**	**10 - 10**	**1.5E+01**	**2.3E+00**	**YES**	**4.5E-02 C**	**YES**	**1.0E+01**	**YES**	**ASL-RSL, ASL-MCL**
	7440-39-3	Barium	1.3E+01 J	2.1E+01 J	UG_L	CAA08-DW02-1008	4/4	200 - 200	2.1E+01	1.2E+02	NO	7.3E+02 N	N/A	2.0E+03	N/A	BBK
	7440-41-7	Beryllium	1.8E-01 J	1.8E-01 J	UG_L	CAA08-DW02-1008	1/4	5 - 5	1.8E-01	2.5E+00	NO	7.3E+00 N	N/A	4.0E+00	N/A	BBK
	7440-43-9	Cadmium	8.5E-01 J	1.1E+00 J	UG_L	CAA08-DW02-1008	2/4	5 - 5	1.1E+00	6.1E-01	YES	1.8E+00 N	NO	5.0E+00	NO	BSL
	7440-70-2	Calcium	7.7E+04	9.9E+04	UG_L	CAA08-DW01-1008	4/4	5000 - 5000	9.9E+04	1.6E+05	NO	N/A	N/A	N/A	N/A	BBK
	7440-48-4	Cobalt	1.1E+00 J	5.8E+00 J	UG_L	CAA08-DW04-1008	3/4	50 - 50	5.8E+00	2.1E+01	NO	1.1E+00 N	N/A	N/A	N/A	BBK
	7439-89-6	**Iron**	**8.3E+03**	**8.3E+03**	**UG_L**	**CAA08-DW04-1008**	**1/4**	**100 - 100**	**8.3E+03**	**3.6E+03**	**YES**	**2.6E+03 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7439-92-1	Lead	1.1E+00 J	1.2E+00 J	UG_L	CAA08-DW03-1008	2/4	10 - 10	1.2E+00	2.1E+01	NO	N/A	N/A	1.5E+01	N/A	BBK
	7439-95-4	Magnesium	1.8E+03 J	3.7E+03 J	UG_L	CAA08-DW04-1008	4/4	5000 - 5000	3.7E+03	3.6E+03	YES	N/A	NUT	N/A	NUT	NUT
	7439-96-5	**Manganese**	**2.1E+01**	**2.5E+02**	**UG_L**	**CAA08-DW04-1008**	**4/4**	**15 - 15**	**2.5E+02**	**5.8E+01**	**YES**	**8.8E+01 N**	**YES**	**N/A**	**N/A**	**ASL-RSL**
	7440-09-7	Potassium	5.5E+02 L	3.4E+03 J	UG_L	CAA08-DW04-1008	4/4	5000 - 5000	3.4E+03	3.5E+03	NO	N/A	N/A	N/A	N/A	BBK
	7782-49-2	Selenium	1.4E+00 J	1.4E+00 J	UG_L	CAA08-DW01-1008	1/4	35 - 35	1.4E+00	ND	YES	1.8E+01 N	NO	5.0E+01	NO	BSL
	7440-23-5	Sodium	4.3E+03 J	1.6E+04	UG_L	CAA08-DW04-1008	4/4	5000 - 5000	1.6E+04	9.9E+03	YES	N/A	NUT	N/A	NUT	NUT
	7440-62-2	Vanadium	8.2E+00 J	8.2E+00 J	UG_L	CAA08-DW02-1008	1/4	50 - 50	8.2E+00	2.6E+01	NO	1.8E+01 N	N/A	N/A	N/A	BBK

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Screening Steps: The maximium concentrations were compared to background concentrations. If exceedances, the maximim concenentrations were then compared to RSLs and MCLs.

[4] Background values from CAX/Yorktown groundwater background; values represent the 95% UTL.
Screening Steps: The maximum concentrations were compared to background concentrations. If exceedances, the maximum concentrations were then compared to RSLs and MCLs.

[5] Oak Ridge National Laboratory (ORNL). November, 2010. Regional Screening Levels for Chemical Contaminants at Superfund Sites.
Available: http://epa-prgs.ornl.gov/chemicals/index.shtml. Adjusted (noncarcinogenic RSLs adjusted by dividing by 10) tap water RSLs.

[6] Drinking water Maximum Contaminant Level (MCL) (USEPA, 2009). Available: http://water.epa.gov/drink/contaminants/index.cfm
RSL value for Chromium VI (chromic acid mists) used as surrogate for chromium.

[7] Rationale Codes

Selection Reason: Above Tap Water Screening Levels (ASL-RSL)
Above Maximim Contaminant Levels (ASL-MCL)

Deletion Reason: Below Background (BBK)
Below Screening Level (BSL)
No Toxicity Information (NTX)
Essential Nutrient (NUT)

COPC = Chemical of Potential Concern
J = Estimated Value
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
RSL = Regional Screening Levels
N/A = Not available or Not applicable

TABLE 2.3a

Step 2 Soil Screening - Risk Ratio, Maximum Detected Concentration

Cheatham Annex Areas of Concern, Williamsburg, Virginia

AOC 8 - Groundwater

Analyte	Detection Frequency	Maximum Detected Concentration (Qualifier)	Sample Location of Maximum Detected Concentration	Tap Water RSL	Acceptable Risk Level	Corresponding Hazard Index[a]	Corresponding Cancer Risk[b]	Target Organ
Volatile Organic Compounds (ug/L)								
Tetrachloroethene	1 / 4	7.0E+00 J	CAA08-DW02-1008	1.1E-01	1E-06	NA	6E-05	NA
Metals (ug/L)								
Arsenic	1 / 4	1.5E+01	CAA08-DW04-1008	4.5E-02	1E-06	NA	3E-04	NA
Iron	1 / 4	8.3E+03	CAA08-DW04-1008	2.6E+04	1	0.3	NA	Gastrointestinal
Manganese	4 / 4	2.5E+02	CAA08-DW04-1008	8.8E+02	1	0.3	NA	CNS
Cumulative Corresponding Hazard Index[c]						**0.6**		
Cumulative Corresponding Cancer Risk[d]							**4E-04**	
							Total Gastrointestinal HI =	0.3
							Total CNS HI =	0.3

Notes:

[a] Corresponding Hazard Index equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[b] Corresponding Cancer Risk equals maximum detected concentration divided by the RSL divided by the acceptable risk level.

[c] Cumulative Corresponding Hazard Index equals sum of Corresponding Hazard Indices for each constituent.

[d] Cumulative Corresponding Cancer Risk equals sum of Corresponding Cancer Risks for each constituent.

Constituent selected as COPC if it contributes to an overall Hazard Index by target organ greater than 0.5 or Cumulative Corresponding Cancer Risk greater than 5E-05, otherwise, constituent not selected as COPC.

Constituents selected as COPCs are indicated by shading.

CNS = Central nervous System

COPC = Constituent of Potential Concern

HI = Hazard Index

J = Estimated Value

µg/L = micrograms per liter

NA = Not available/not applicable

Appendix B
Ecological Risk Screening

APPENDIX B

Ecological Risk Screening

An ecological risk screening was performed to determine the potential for ecological risks associated with direct exposure to site media (surface soil [0 to 6 inches], subsurface soil [6 to 24 inches], surface water, and sediment), and potential ecological risks in receiving water bodies (where applicable) from groundwater transport at Areas of Concern (AOCs) 1, 2, 6, 7, and 8. The results of the ecological risk screening provide a preliminary indication of potential risks from exposure to chemicals of potential concern (COPCs) identified for each AOC, and are used to help determine whether the sites require further evaluation (e.g., a baseline risk assessment or additional data collection) or if risks are acceptable.

B.1 Ecological Conceptual Site Model

The ecological conceptual site model (CSM) provides a brief summary of site conditions, potential contaminant migration pathways, and exposure pathways to potential receptors. Sections 3 through 7 of the SI report provide details on the physical setting and history of each AOC.

AOC 1 is comprised of two ravines (north and south) associated with unnamed tributaries to Jones Pond. AOC 1 North is approximately 0.2 acre in size while AOC 1 South is about 0.4 acre in size. Both areas are wooded. Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Due to the small size of each area, exposures to upper trophic level receptors (i.e., birds and mammals) are not considered significant and are not evaluated. There is the potential for groundwater transport and subsequent discharge from the site to Jones Pond (freshwater).

AOC 2 is a small (less than 1 acre) wooded site that contains no wetlands or other water bodies. Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Due to the small size of the site, exposures to upper trophic level receptors (i.e., birds and mammals) are not considered significant and are not evaluated. Since there are no nearby water bodies downgradient of the site, potential groundwater transport and subsequent discharge is not evaluated.

AOC 6 is comprised of three noncontiguous areas: (1) Ammonia Settling Pits (ASP); (2) 1918 Drum Storage Area (DSA); and (3) TNT Catch Box Ruins (CBR). Each of these areas is very small (less than 1 acre). The CBR and ASP are both wooded and are situated near the banks of Penniman Lake (freshwater). The DSA is located in a developed area and mainly consists of open maintained grass areas. Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Due to the small size of each area, exposures to terrestrial upper trophic level receptors (i.e., birds and mammals) are not considered significant and are not evaluated. There is the potential for groundwater transport and subsequent discharge from each area to Penniman Lake (freshwater). In addition, there is the potential for surface transport from the ASP and CBR to Penniman Lake and subsequent exposure to lower trophic level aquatic receptors (i.e., aquatic plants, aquatic and benthic invertebrates, fish, amphibians, and reptiles). Potential exposures of upper trophic level aquatic receptors (i.e. birds and mammals) adjacent to these two areas are not evaluated in this SI since an evaluation of Penniman Lake as a whole will be conducted as part of a separate study.

AOC 7 is a 1.5 acre wooded site that contains no wetlands or other water bodies. Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Due to the small size of areas on the site that contain debris (source areas), exposures to upper trophic level receptors (i.e., birds and mammals) are not considered significant and are not evaluated. There is the potential for groundwater transport and subsequent discharge from the site to Cheatham Pond (freshwater).

AOC 8 is a 1.5 acre sparsely wooded site that contains no wetlands or other water bodies, although there is a small depression on the site that may temporarily retain water following a precipitation event. Complete exposure pathways exist to lower trophic level terrestrial receptors (i.e., plants and soil invertebrates). Due to the small size of areas on the site that contain debris (source areas), exposures to upper trophic level receptors (i.e.,

birds and mammals) are not considered significant and are not evaluated. There is the potential for groundwater transport and subsequent discharge from the site to the York River (brackish to marine).

B.2 Ecological Risk Screening Methodology

The ecological risk screening was conducted using a two step process within the overall decision analysis process described in Section 1.1 of the SI report, which is comprised of three steps. The ERA process falls within Steps 2a and 2b of this overall process.

If a CERCLA-related release is suspected (Step 1 of the overall decision process), site-specific analytical data for detected constituents are compared to conservative ecological screening values and background 95 percent upper tolerance limits (UTLs), where available (Step 2a). Medium-specific screening values used in the assessment, which are based upon lower trophic level exposures per the CSM (Section B.1), are contained in Tables B-1 (soil), B-2 (surface water; also used to screen groundwater), and B-3 (sediment). Soil screenings were conducted for both surface samples (0 to 6 inches) and subsurface samples (6 to 24 inches) since ecological exposures are generally considered to be confined to the top two feet of the soil column. The surface water values used to screen groundwater considered the salinity of the receiving water body to determine whether to apply freshwater or marine values. As such, freshwater values were used at AOCs 1, 6, and 7, while marine values were used at AOC 8 (although freshwater values were extrapolated to this site if marine values were not available). No groundwater screening was conducted at AOC 2 per the CSM. The surface water and sediment screenings at AOC 6 used freshwater values for both surface water and sediment. Separate screenings were conducted at AOC 6 for surface (0 to 4 inches) and subsurface (4 to 8 inches) sediment. Detected organic chemicals in sediment were screened against both Screening Level Concentration (SLC) based screening values and Equilibrium Partitioning (EqP) based screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Table B-3.

Although both total and dissolved groundwater data are included in the screening tables, only dissolved metals data are considered when selecting COPCs because chemicals in groundwater are most likely to travel dissolved in water rather than adhered to particles since they must travel through soil pores or fractured rock. Similarly, when groundwater discharges to a water body (at which time ecological exposures become possible), the bulk of the discharged chemicals are likely to be dissolved in water since the discharge must pass through the pores in the underlying sediments. Thus, the dissolved concentrations are likely to be more representative of what would be transported via the groundwater than the total concentrations. Once discharged, the dissolved metal fraction in water (filtered samples) is more representative of the bioavailable fraction to aquatic receptors than the total metal fraction (unfiltered samples) (USEPA, 1996). This is reflected in how the most recent Ambient Water Quality Criteria have been developed for many metals, that is, they are based upon the dissolved fraction (USEPA, 2009).

Although ecological receptors do not typically have direct exposure to groundwater, surface water screening values were compared to analytical groundwater data (with and without dilution factors) in order to provide a conservative evaluation of the potential for significant contaminant transport via groundwater to downgradient receiving water bodies. In the absence of site-specific dilution factors for groundwater, Buchman (1999) recommends using a dilution factor of 10 to account for the dilution expected during migration and upon discharge of groundwater to surface water.

The background UTLs were facility-specific values derived for Yorktown/CAX. These values, which are described in Section 1.1.1 of the SI report, have not yet been formally issued in a report but have been approved for use by the CAX Partnering Team. Soil UTL values, which were developed separately for surface and subsurface soils, are the same for all of the AOCs. The background UTL values for groundwater used in the evaluation for each AOC are as follows:

- Yorktown-Eastover aquifer for AOC 6, AOC 7, and AOC 8
- Cornwalis Cave aquifer for AOC 1

There are no background data for surface water and sediment and, therefore, a comparison to background levels was not performed for these two media.

If the maximum detected concentration exceeded both ecological screening values and background UTLs, exceeded either screening values or UTLs if only one of the two were available for a constituent, or neither a screening value or UTL was available, the constituent was retained as an initial COPC for that medium. This constituted Step 2a of the decision process and also corresponds to a screening level ERA (which is Step 2 of the ERA process outlined in USEPA [1997] and NAVFAC [2003]).

For the screening value and background exceedances that are likely attributable to a historic CERCLA-related release, an evaluation of the data using more realistic assumptions, if possible, was done. This more realistic evaluation (Step 2b of the decision process) was performed to help ensure appropriate perspective is considered regarding the release such that informed decisions on the need for further investigation or action can be made (which is Step 3 of the decision process). Step 2b of the decision process corresponds to the first step of a baseline ERA (which is Step 3A of the ERA process outlined in NAVFAC [2003]).

Where there are exceedances of the ecological screening values and background, more realistic evaluations consider the following types of information:

- The size of the site
- The type and quality of the habitat present on the site and in surrounding areas, and the potential receptors likely to be present
- The frequency and magnitude of screening value and background exceedances
- Average exposure concentrations
- The spatial pattern of exceedances
- Additional screening values from the literature, where applicable
- Other site-specific factors that might be relevant to assessing potential exposures (e.g., soil type, bioavailability, fate, transport properties)

Where more realistic evaluations of the data are conducted, the rationale for those evaluations is included in the discussion. It is recognized that these more realistic evaluations may have uncertainty due to the limited amount of data generally available at the SI stage. However, these additional risk evaluations provide yet another line of evidence that, when considered with all other site-specific information and evaluations, increase the level of confidence by which conclusions for each site are drawn.

B.3 Ecological Risk Screening Results

The ecological risk screening was performed for surface soil and subsurface soil at all AOCs, for groundwater at AOCs 1, 6, 7, and 8, and for surface water and sediment at AOC 6.

B.3.1 AOC 1 Risk Screening Results

The screening for surface soil, subsurface soil, and groundwater at AOC 1 was conducted for two areas: (1) AOC 1 North; and (2) AOC 1 South. The results of the risk evaluation for AOC 1 are presented in Tables B-4 through B-15.

Surface Soil

AOC 1 North

Eight inorganics (aluminum, arsenic, cyanide, iron, lead, manganese, mercury, and zinc) and two organics (endrin and endrin aldehyde) exceeded screening values based upon maximum detected concentrations and, except for iron, also exceeded background UTLs, where available (Tables B-4 and B-5). A screening value was not available for benzaldehyde. Thus, aluminum, arsenic, cyanide, lead, manganese, mercury, zinc, endrin, endrin aldehyde, and benzaldehyde were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Benzaldehyde, which did not have a screening value, was detected at a maximum concentration of 260 µg/kg. This maximum concentration was compared with the range of soil screening values for all other SVOCs (not including atrazine, a herbicide) with such values. These values, which are provided in Table B-1, ranged from 380 to 40,000 µg/kg. The maximum site concentration of benzaldehyde was less than the soil screening values for these other SVOCs. Thus, this constituent was not identified as a refined COPC.
- The mean HQs for aluminum, arsenic, cyanide, lead, manganese, and mercury were less than one. Thus, these constituents were not identified as refined COPCs.
- The mean HQ exceeded one for endrin (1.16), endrin aldehyde (1.13), and zinc (1.10); these three constituents were identified as refined COPCs. However, ecological risks are likely to be low due to the very small size of the site (0.2 acre).

AOC 1 South

Six inorganics (arsenic, copper, lead, manganese, mercury, and zinc) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-6 and B-7). Screening values were not available for 2-butanone, acetone, and carbazole. Thus, these nine constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Acetone and 2-butanone, which did not have screening values, were detected at maximum concentrations of 34.0 and 8.00 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in Table B-1, ranged from 173 to 64,000 µg/kg. The maximum site concentrations of acetone and 2-butanone were less than the soil screening values for these other VOCs. Thus, these constituents were not identified as refined COPCs.
- Carbazole was detected in one surface soil sample at a maximum concentration of 610 µg/kg (0.61 mg/kg). While there is little information regarding the potential toxicity to soil invertebrates and/or terrestrial plants following direct exposure to this chemical, available data suggest that the maximum observed concentrations of this chemical are too low to elicit adverse effects. In 21-day studies with oligochaete worms exposed to carbazole-spiked soils, the resulting Lethal Concentration (survival) to 50 percent of the population (LC_{50}) and Effect Concentration (reproduction) to 50 percent of the population (EC_{50}) values were greater than 2,100 and 52 mg/kg, respectively (Sverdrup et al. 2002). In a similar 21-day study exposing collembolans or springtails to spiked soils, the LC_{50} and EC_{50} values were 2,500 and 35 mg/kg, respectively, for carbazole (Sverdrup et al. 2001). Applying an uncertainty factor of 5 (Table B-3a) to the lower of these two EC_{50} (chronic LOEC) values (to approximate a chronic NOEC) yields an effects concentration of 7.00 mg/kg. The maximum concentration of carbazole is well below this effect concentration. Thus, carbazole was not identified as a refined COPC.
- The mean HQs for arsenic, copper, and mercury were less than one. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded one for lead (1.35), manganese (1.16), and zinc (1.11); these three constituents were identified as refined COPCs. However, ecological risks are likely to be low due to the small size of the site (0.4 acre).

Subsurface Soil

AOC 1 North

Aluminum exceeded screening values based upon maximum detected concentrations and also exceeded the background UTL (Tables B-8 and B-9). Iron also exceeded screening values but did not exceed the background UTL. A screening values was not available for 2-butanone. Thus, aluminum and 2-butanone were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 2-Butanone, which did not have a screening value, was detected at a maximum concentration of 2.00 µg/kg. This maximum concentration was compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in Table B-1, ranged from 173 to 64,000 µg/kg. The maximum site concentration of 2-butanone was less than the soil screening values for these other VOCs. Thus, this constituent was not identified as a refined COPC.
- Aluminum exceeded its pH-based soil screening value in one of 10 samples by a small margin (5.4 versus a screening value of < 5.5). However, the mean pH at the site was greater than 5.5 and the one sample whose pH was below the screening value had a soil concentration that was less than the background UTL. Thus, this constituent was not identified as a refined COPC.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

AOC 1 South

Five inorganics (copper, iron, lead, manganese, and zinc) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-10 and B-11). Screening values were not available for 2-butanone, acetone, and carbon disulfide. Thus, these eight constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Acetone, 2-butanone, and carbon disulfide, which did not have screening values, were detected at maximum concentrations of 48.0, 9.00, and 2.00 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in Table B-1, ranged from 173 to 64,000 µg/kg. The maximum site concentrations of acetone, 2-butanone, and carbon disulfide were less than the soil screening values for these other VOCs. Thus, these constituents were not identified as refined COPCs.
- The mean HQs for copper, iron, and manganese were less than one. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded one for lead (3.99) and zinc (1.85); these two constituents were identified as refined COPCs. However, ecological risks are likely to be low due to the small size of the site (0.4 acre).

Groundwater

AOC 1 North

Sixteen inorganics (aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-12 and B-13). Aluminum, iron, and manganese exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, aluminum, iron, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- While the mean HQs for aluminum, iron, and manganese exceeded one based upon undiluted concentrations, none of the mean HQs exceeded one when a dilution factor of 10 was applied. Thus, none of these three constituents was identified as a refined COPC.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

AOC 1 South

Twelve inorganics (aluminum, barium, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-14 and B-15). Aluminum, barium, iron, lead, and manganese exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, aluminum, barium, iron, lead, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for lead did not exceed one. Thus, lead was not identified as a refined COPC.
- While the mean HQs for aluminum, barium, and manganese exceeded one based upon undiluted concentrations, none of the mean HQs exceeded one when a dilution factor of 10 was applied. Thus, none of these three constituents was identified as a refined COPC.
- The mean HQ for iron exceeded one with a dilution factor of 10 applied. Thus, iron was identified as a refined COPC.

AOC 1 Risk Screening Summary

COPCs were identified in AOC 1 North surface soil (endrin, endrin aldehyde, and zinc) but not in subsurface soil or groundwater. However, endrin and endrin aldehyde are likely attributable to normal pesticide application. Ecological risks are likely to be low due to the very small size of the site (0.2 acre).

COPCs were identified in AOC 1 South surface soil (lead, manganese, and zinc), subsurface soil (lead and zinc), and groundwater (iron). However, ecological risks are likely to be low due to the very small size of the site (0.4 acre).

B.3.2 AOC 2 Risk Screening Results

The results of the risk evaluation for AOC 2 are presented in Tables B-16 through B-19.

Surface Soil

Four inorganics (arsenic, manganese, mercury, and selenium) and two organics (4,4'-DDE and 4,4'-DDT) exceeded screening values based upon maximum detected concentrations. All but manganese also exceeded background UTLs, where available (Tables B-16 and B-17). The screening values for aluminum and iron were pH-based but soil pH data were not available. Aluminum did not exceed background UTLs but iron did. Thus, arsenic, iron, mercury, selenium, 4,4'-DDE, and 4,4'-DDT were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for 4,4'-DDE, arsenic, and selenium were less than one. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded one for 4,4'-DDT (1.08) and mercury (11.2); these two constituents were identified as refined COPCs. Iron was also identified as a refined COPC because it exceeded the background UTL and soil pH data were not available.

Subsurface Soil

Three inorganics (arsenic, mercury, and selenium) and one organic (4,4'-DDE) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-18 and B-19). Thus, these four constituents were identified as initial COPCs. The screening values for aluminum and iron were pH-based but soil pH data were not available. Aluminum did not exceed background UTLs but iron did. Thus, iron was also identified as an initial COPC.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for 4,4'-DDE, arsenic, and selenium were less than one. Thus, these three constituents were not identified as refined COPCs.
- Iron was not identified as a refined COPC based upon the low magnitude of its background UTL exceedance (ratio of 1.31).
- The mean HQ exceeded one for mercury (6.50); this constituent was identified as a refined COPC.

AOC 2 Risk Screening Summary

COPCs were identified in AOC 2 surface soil (iron, mercury, and 4,4'-DDT) and subsurface soil (mercury). However, 4,4'-DDT is likely attributable to normal pesticide application.

B.3.3 AOC 6 Risk Screening Results

The screening for surface soil, subsurface soil, and groundwater at AOC 6 was conducted for the following four areas: (1) the Ammonia Settling Pits subarea; (2) the 1918 Drum Storage subarea, and (3) the TNT Graining House and TNT Catch Box Ruins subareas. No spatial groupings were used for surface water and sediment. The results of the risk evaluation for AOC 6 are presented in Tables B-20 through B-43.

Surface Soil

Ammonia Settling Pits

Three inorganics (aluminum, iron, and mercury) and one explosive (HMX) exceeded screening values based upon maximum detected concentrations. Aluminum and iron did not exceed background UTLs (Tables B-20 and B-21). Screening values were not available for 1,3,5-trinitrobenzene and 1,3-dinitrobenzene. Thus, mercury, 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, and HMX were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, which did not have screening values, were detected at maximum concentrations of 2,100 and 100 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg. The maximum site concentrations of 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were less than the soil screening values for these other explosives. Thus, these two constituents were not identified as refined COPCs.
- The mean HQs for HMX and mercury were less than one. Thus, these two constituents were not identified as refined COPCs.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

1918 Drum Storage

Three inorganics (aluminum, iron, and lead) exceeded screening values based upon maximum detected concentrations. Aluminum and lead, but not iron, also exceeded background UTLs (Tables B-22 and B-23). Thus, aluminum and lead were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for aluminum and lead were less than one. Thus, these two constituents were not identified as refined COPCs.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

TNT Graining House and TNT Catch Box Ruins

Six inorganics (aluminum, iron, lead, mercury, selenium, and zinc) and one explosive (2,4,6-trinitrotoluene) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-24 and B-25). Screening values were not available for 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2-nitrotoluene, 3,5-dinitroaniline, and benzaldehyde. Thus, these 12 constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Benzaldehyde, which did not have a screening value, was detected at a maximum concentration of 320 µg/kg. This maximum concentration was compared with the range of soil screening values for all other SVOCs (not including atrazine, a herbicide) with such values. These values, which are provided in Table B-1, ranged from 380 to 40,000 µg/kg. The maximum site concentration of benzaldehyde was less than the soil screening values for these other SVOCs. Thus, this constituent was not identified as a refined COPC.
- 1,3,5-Trinitrobenzene, 1,3-dinitrobenzene, and 3,5-dinitroaniline, which did not have screening values, were detected at maximum concentrations of 1,100, 730, and 890 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg. The maximum site concentrations of 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, and 3,5-dinitroaniline were less than the soil screening values for these other explosives. Thus, these three constituents were not identified as refined COPCs.
- The mean HQs for aluminum, iron, lead, mercury, and zinc were less than one. Thus, these five constituents were not identified as refined COPCs.
- 2-Nitrotoluene, which did not have a screening value, was detected at a maximum concentration of 48,000 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg. The maximum site concentration of 2-nitrotoluene exceeded the soil screening values for some of these other explosives. Thus, this constituent was identified as a refined COPC.
- The mean HQ exceeded one for 2,4,6-trinitrotoluene (69.7) and selenium (2.48); these two constituents were identified as refined COPCs.

Subsurface Soil

Ammonia Settling Pits

Only aluminum exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-26 and B-27). A screening value was not available for 1,3,5-trinitrobenzene. Thus, these two constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Aluminum exceeded its pH-based soil screening value in 4 of 5 samples but only exceeded the background UTL in one sample. The pH in the one sample that exceeded the background UTL was greater than 5.5 (and thus did not exceed the screening value). Thus, this constituent was not identified as a refined COPC.
- 1,3,5-Trinitrobenzene, which did not have a screening value, was detected at a maximum concentration of 41.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg. The maximum site concentration of 1,3,5-trinitrobenzene was less than the soil screening values for these other explosives. Thus, this constituent was not identified as a refined COPC.

- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

1918 Drum Storage

No constituent exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-28 and B-29). Thus, there are no unacceptable ecological risks associated with this medium.

TNT Graining House and TNT Catch Box Ruins

Three inorganics (aluminum, arsenic, and selenium) and two explosives (2,4-dinitrotoluene and 2,4,6-trinitrotoluene) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-30 and B-31). Screening values were not available for 1,3-dinitrobenzene and 3,5-dinitroaniline. Thus, these seven constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 1,3-Dinitrobenzene and 3,5-dinitroaniline, which did not have screening values, were detected at maximum concentrations of 1,600 and 550 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg. The maximum site concentrations of 1,3-dinitrobenzene and 3,5-dinitroaniline were less than the soil screening values for these other explosives. Thus, these two constituents were not identified as refined COPCs.
- The mean HQs for 2,4-dinitrotoluene, aluminum, and arsenic were less than one. Thus, these three constituents were not identified as refined COPCs.
- The mean HQ exceeded one for 2,4,6-trinitrotoluene (48.1) and selenium (1.76); these two constituents were identified as refined COPCs.

Groundwater

Ammonia Settling Pits

Ten inorganics (aluminum, cadmium, chromium, cobalt, iron, lead, manganese, nickel, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-32 and B-33). Only cobalt, iron, and manganese exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, cobalt, iron, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for cobalt did not exceed one. Thus, cobalt was not identified as a refined COPC.
- The mean HQs for iron and manganese exceeded one with a dilution factor of 10 applied. Thus, iron and manganese were identified as refined COPCs.

1918 Drum Storage

Fourteen inorganics (aluminum, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-34 and B-35). Only aluminum exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded the background UTL. Thus, aluminum was identified as an initial COPC.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- While the mean HQ for aluminum exceeded one based upon undiluted concentrations, the mean HQ did not exceed one when a dilution factor of 10 was applied. Thus, aluminum was not identified as a refined COPC.

- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

TNT Graining House and TNT Catch Box Ruins

Twelve inorganics (aluminum, arsenic, beryllium, chromium, copper, iron, lead, manganese, nickel, silver, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-36 and B-37). Aluminum, chromium, copper, iron, lead, manganese, and silver exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, aluminum, chromium, copper, iron, lead, manganese, and silver were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for chromium did not exceed one. Thus, chromium was not identified as a refined COPC.
- While the mean HQs for copper, lead, manganese, and silver exceeded one based upon undiluted concentrations, the mean HQs did not exceed one when a dilution factor of 10 was applied. Thus, none of these four constituents was not identified as a refined COPC.
- The mean HQs for aluminum and iron exceeded one with a dilution factor of 10 applied. Thus, aluminum and iron were identified as refined COPCs.

Penniman Lake Surface Water

Barium exceeded screening values based upon maximum detected concentrations (Tables B-38 and B-39). Exceedances occurred in both filtered and unfiltered samples. Thus, barium was identified as an initial COPC.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The screening value for barium (4 μg/L) is very conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural water bodies but is very toxic, while the surface water sample was measured for total barium. For comparison, the USEPA Region 5 freshwater screening value for total barium is 200 μg/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 μg/L). Thus, this screening value does not reflect the bioavailability of barium in the aquatic environment. Barium compounds have low toxicity to aquatic organisms, with the barium ion responsible for the toxic effects (Federal Register, 62[2]:366-372, 3 January 1997). In aquatic media, barium compounds are likely to precipitate out of solution as barium sulfate ($BaSO_4$) or barium carbonate ($BaCO_3$) when they react with the sulfate or carbonate present in most surface water. Thus, the barium is rendered essentially non-toxic and does not represent a risk to aquatic organisms. Barium was also not identified as a COPC in sediment. Thus, barium is not identified as a refined COPC in surface water.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

Penniman Lake Surface Sediment

Arsenic and 4-amino-2,6-dinitrotoluene exceeded screening values based upon maximum detected concentrations (Tables B-40 and B-41). Bis(2-ethylhexyl)phthalate exceeded the SLC screening value, but not the EqP screening value, based upon the maximum detected concentration. However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC. A screening value was not available for beryllium, which was detected in both surface sediment samples. Thus, arsenic, 4-amino-2,6-dinitrotoluene, and beryllium were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for arsenic and 4-amino-2,6-dinitrotoluene were less than one. In addition, neither chemical exceeded screening values in the field duplicate of the one sample that exceeded the screening value (the chemicals were not detected in the field duplicate at reporting limits less than the screening values). Thus, these two constituents were not identified as refined COPCs.
- Beryllium did not have an available screening value. However, this constituent is not know to be associated with any site activities and is thus not identified as a refined COPC.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

Penniman Lake Subsurface Sediment

2,6-Dinitrotoluene exceeded screening values based upon maximum detected concentrations (Tables B-42 and B-43). A screening value was not available for beryllium, which was detected in both subsurface sediment samples. Thus, these two constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQ for 2,6-dinitrotoluene was less than one. Thus, this constituent was not identified as a refined COPC.
- Beryllium did not have an available screening value. However, this constituent is not know to be associated with any site activities and is thus not identified as a refined COPC.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

AOC 6 Risk Screening Summary

COPCs were identified in Ammonia Settling Pits groundwater (iron and manganese) but not in surface or subsurface soil. No COPCs were identified in 1918 Drum Storage Area surface soil, subsurface soil, or groundwater. COPCs were identified in TNT Graining House and TNT Catch Basin Ruins surface soil (2-nitrotoluene, TNT, and selenium), subsurface soil (TNT and selenium), and groundwater (aluminum and iron). No COPCs were identified in AOC 6 (Penniman Lake) surface water or sediment.

B.3.4 AOC 7 Risk Screening Results

The results of the risk evaluation for AOC 7 are presented in Tables B-44 through B-49.

Surface Soil

Six inorganics (arsenic, chromium, copper, lead, manganese, and zinc) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-44 and B-45). Thus, these six constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The mean HQs for arsenic, chromium, and copper were less than one. Thus, these three constituents were not identified as refined COPCs.
- The mean HQs exceeded one for lead (1.55), manganese (1.49), and zinc (1.19); these three constituents were identified as refined COPCs.

Subsurface Soil

Five inorganics (aluminum, lead, manganese, selenium, and zinc) exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-46 and B-47).

Screening values were not available for nitroguanidine. Thus, these six constituents were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Nitroguanidine, which did not have a screening value, was detected at a maximum concentration of 63.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg. The maximum site concentration of nitroguanidine was less than the soil screening values for these other explosives. Thus, this constituent was not identified as a refined COPC.
- The mean HQs for aluminum, lead, manganese, and zinc were less than one. Thus, these four constituents were not identified as refined COPCs.
- Selenium exceeded screening values in 1 of 6 samples at a maximum HQ of 1.23. The background UTL was equaled, but not exceeded, in this one sample. Thus, selenium is considered to be consistent with background and was not identified as a refined COPC.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

Groundwater

Twelve inorganics (aluminum, beryllium, cadmium, chromium, copper, iron, lead, manganese, nickel, selenium, vanadium, and zinc) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-48 and B-49). Only aluminum, iron, and silver exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, aluminum, iron, and silver were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The maximum HQ for silver equaled, but did not exceed, one. Thus, silver was not identified as a refined COPC.
- While the mean HQs for aluminum and iron exceeded one based upon undiluted concentrations, the mean HQs did not exceed one when a dilution factor of 10 was applied. Thus, aluminum and iron were not identified as refined COPCs.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

AOC 7 Risk Screening Summary

COPCs were identified in AOC 7 surface soil (lead, manganese, and zinc) but not subsurface soil or groundwater.

B.3.5 AOC 8 Risk Screening Results

The results of the risk evaluation for AOC 8 are presented in Tables B-50 through B-55.

Surface Soil

Four inorganics (aluminum, iron, selenium, and zinc) and one organic (endrin aldehyde) exceeded screening values based upon maximum detected concentrations. Aluminum and iron did not exceeded background UTLs, however (Tables B-50 and B-51). Screening values were not available for acetone and benzaldehyde. Thus, selenium, zinc, endrin aldehyde, acetone, and benzaldehyde were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- Benzaldehyde, which did not have a screening value, was detected at a maximum concentration of 180 µg/kg. This maximum concentration was compared with the range of soil screening values for all other SVOCs (not

including atrazine, a herbicide) with such values. These values, which are provided in Table B-1, ranged from 380 to 40,000 µg/kg. The maximum site concentration of benzaldehyde was less than the soil screening values for these other SVOCs. Thus, this constituent was not identified as a refined COPC.

- Acetone, which did not have a screening value, was detected at a maximum concentration of 36.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in Table B-1, ranged from 173 to 64,000 µg/kg. The maximum site concentration of acetone was less than the soil screening values for these other VOCs. Thus, acetone was not identified as a refined COPC.
- The mean HQ for zinc was less than one. Thus, zinc was not identified as a refined COPC.
- Selenium exceeded its screening value and background UTL in just 1 of 9 samples at a maximum HQ of 1.15 (maximum ratio to the background UTL of 1.18). Based upon the low magnitude and frequency of these exceedances, selenium was not identified as a refined COPC.
- The mean HQ exceeded one for endrin aldehyde (2.80); this constituent was identified as a refined COPC.

Subsurface Soil

Endrin aldehyde was the only constituent that exceeded screening values based upon maximum detected concentrations and also exceeded background UTLs, where available (Tables B-52 and B-53). A screening value was not available for 2-butanone. Thus, endrin aldehyde and 2-butanone were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- 2-Butanone, which did not have a screening value, was detected at a maximum concentration of 2.00 µg/kg. This maximum concentration was compared with the range of soil screening values for all other VOCs with such values. These values, which are provided in Table B-1, ranged from 173 to 64,000 µg/kg. The maximum site concentration of 2-butanone was less than the soil screening values for these other VOCs. Thus, this constituent was not identified as a refined COPC.
- The mean HQ exceeded one for endrin aldehyde (2.05); this constituent was identified as a refined COPC.

Groundwater

Two inorganics (iron and manganese) exceeded screening values based upon maximum detected concentrations in unfiltered sample and also exceeded background UTLs, where available (Tables B-54 and B-55). Aluminum, iron, and manganese exceeded screening values based upon maximum detected concentrations in filtered sample and also exceeded background UTLs, where available. Thus, aluminum, iron, and manganese were identified as initial COPCs.

The initial COPCs were then evaluated using more realistic assumptions to select refined COPCs, as follows:

- The maximum HQ for manganese did not exceed one. Thus, manganese was not identified as a refined COPC.
- While the mean HQs for aluminum and iron exceeded one based upon undiluted concentrations, the mean HQs did not exceed one when a dilution factor of 10 was applied. Thus, aluminum and iron were not identified as refined COPCs.
- No refined COPCs were identified. Thus, there are no unacceptable ecological risks associated with this medium.

AOC 8 Risk Screening Summary

COPCs were identified in AOC 8 surface soil and subsurface soil (endrin aldehyde) but not groundwater. However, this pesticide is likely the result of historic use and not related to a release at the site. Ecological risks at AOC 8 are expected to be minimal.

B.4 Ecological Risk Screening Conclusion

COPCs were identified in AOC 1 North surface soil (endrin, endrin aldehyde, and zinc) but not in subsurface soil or groundwater. However, endrin and endrin aldehyde are likely attributable to normal pesticide application. Ecological risks are likely to be low due to the very small size of the site (0.2 acre). COPCs were identified in AOC 1 South surface soil (lead, manganese, and zinc), subsurface soil (lead and zinc), and groundwater (iron). However, ecological risks are likely to be low due to the very small size of the site (0.4 acre).

COPCs were identified in AOC 2 surface soil (iron, mercury, and 4,4'-DDT) and subsurface soil (mercury). However, 4,4'-DDT is likely attributable to normal pesticide application. Groundwater transport from this site is not expected to be significant based upon the distance to the nearest water body.

For AOC 6, COPCs were identified in Ammonia Settling Pits groundwater (iron and manganese) but not in surface or subsurface soil. No COPCs were identified in 1918 Drum Storage Area surface soil, subsurface soil, or groundwater. COPCs were identified in TNT Graining House and TNT Catch Basin Ruins surface soil (2-nitrotoluene, TNT, and selenium), subsurface soil (TNT and selenium), and groundwater (aluminum and iron). No COPCs were identified in AOC 6 (Penniman Lake) surface water or sediment.

COPCs were identified in AOC 7 surface soil (lead, manganese, and zinc) but not subsurface soil or groundwater.

COPCs were identified in AOC 8 surface soil and subsurface soil (endrin aldehyde) but not groundwater. However, this pesticide is likely the result of historic use and not related to a release at the site. Ecological risks at AOC 8 are expected to be minimal.

B.5 References

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Ecological Risk Screening Tables

TABLE B-1
Ecological Screening Values - Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Screening Value	Units	Reference	Comments
Explosives				
1,3,5-Trinitrobenzene	NSV	--	--	
1,3-Dinitrobenzene	NSV	--	--	
2,4,6-Trinitrotoluene	10,000	ug/kg	Talmage et al. 1999	Plant
2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate
2-Amino-4,6-dinitrotoluene	80,000	ug/kg	Talmage et al. 1999	Plant
2-Nitrotoluene	NSV	--	--	
3,5-Dinitroaniline	NSV	--	--	
3-Nitrotoluene	NSV	--	--	
4-Amino-2,6-dinitrotoluene	80,000	ug/kg	2-Amino-4,6-dinitrotoluene	Plant
4-Nitrotoluene	NSV	--	--	
HMX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
Nitroglycerine	NSV	--	--	
Nitroguanidine	NSV	--	--	
Perchlorate	1,000	ug/kg	USEPA 2002	Invertebrate
PETN	NSV	--	--	
RDX	10,000	ug/kg	Talmage et al. 1999	Invertebrate
Tetryl	10,000	ug/kg	Talmage et al. 1999	Plant
Inorganics				
Aluminum	pH < 5.5	--	USEPA 2003a	Eco-SSL
Antimony	78.0	mg/kg	USEPA 2005a	Eco-SSL - Invertebrate
Arsenic	18.0	mg/kg	USEPA 2005b	Eco-SSL - Plant
Barium	330	mg/kg	USEPA 2005c	Eco-SSL - Invertebrate
Beryllium	40.0	mg/kg	USEPA 2005d	Eco-SSL - Invertebrate
Cadmium	32.0	mg/kg	USEPA 2005e	Eco-SSL - Plant
Chromium	64.0	mg/kg	CCME 2007	Soil Quality Guideline
Cobalt	13.0	mg/kg	USEPA 2005f	Eco-SSL - Plant
Copper	70.0	mg/kg	USEPA 2007a	Eco-SSL - Plant
Cyanide	15.8	mg/kg	MHSPE 2000	Geomean of target/intervention - complex
Iron	5 < pH > 8	--	USEPA 2003b	Eco-SSL

TABLE B-1
Ecological Screening Values - Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Screening Value	Units	Reference	Comments
Lead	120	mg/kg	USEPA 2005g	Eco-SSL - Plant
Manganese	220	mg/kg	USEPA 2007b	Eco-SSL - Plant
Mercury	0.10	mg/kg	Efroymson et al. 1997b	Invertebrate
Nickel	38.0	mg/kg	USEPA 2007c	Eco-SSL - Plant
Selenium	0.52	mg/kg	USEPA 2007d	Eco-SSL - Plant
Silver	560	mg/kg	USEPA 2006c	Eco-SSL - Plant
Thallium	1.00	mg/kg	Efroymson et al. 1997a	Plant
Vanadium	130	mg/kg	CCME 2007	Soil Quality Guideline
Zinc	120	mg/kg	USEPA 2007e	Eco-SSL - Invertebrate
Pesticides/PCBs				
4,4'-DDD	583	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
4,4'-DDE	114	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
4,4'-DDT	100	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Aldrin	3.63	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
alpha-BHC	226	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
alpha-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Aroclor-1016	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1221	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1232	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1242	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1248	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1254	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
Aroclor-1260	8,000	ug/kg	Efroymson et al. 1997a	Lowest EC50 (40,000); UF of 5
beta-BHC	342	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
delta-BHC	226	ug/kg	alpha-BHC	
Dieldrin	10.5	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Endosulfan I	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Endosulfan II	6.32	ug/kg	MHSPE 2000	Geomean of target/intervention
Endosulfan sulfate	6.32	ug/kg	Endosulfan	
Endrin	1.95	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Endrin aldehyde	1.95	ug/kg	Endrin	
Endrin ketone	1.95	ug/kg	Endrin	

TABLE B-1
Ecological Screening Values - Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Screening Value	Units	Reference	Comments
gamma-BHC (Lindane)	7.75	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
gamma-Chlordane	11.0	ug/kg	MHSPE 2000	Geomean of target/intervention
Heptachlor	52.9	ug/kg	MHSPE 2000	Geomean of target/intervention
Heptachlor epoxide	52.9	ug/kg	Heptachlor	
Methoxychlor	500	ug/kg	Beyer 1990	B value
Toxaphene	500	ug/kg	Beyer 1990	B value
Semivolatile Organic Compounds				
1,1-Biphenyl	13,600	ug/kg	Efroymson et al. 1997a	EC50 (68,000); UF of 5
1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
2,2'-Oxybis(1-chloropropane)	NSV	--	--	
2,4,5-Trichlorophenol	1,350	ug/kg	Efroymson et al. 1997a	Plant NOEC
2,4,6-Trichlorophenol	580	ug/kg	Efroymson et al. 1997b	LC50 of 58,000; UF of 100
2,4-Dichlorophenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2,4-Dimethylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2,4-Dinitrophenol	20,000	ug/kg	Efroymson et al. 1997a	Plant NOEC
2,4-Dinitrotoluene	11,000	ug/kg	NRCC 2006	Plant/Invertebrate
2,6-Dinitrotoluene	8,500	ug/kg	NRCC 2006	Plant/Invertebrate
2-Chloronaphthalene	LMW PAH	--	--	
2-Chlorophenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2-Methylnaphthalene	LMW PAH	--	--	
2-Methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
2-Nitroaniline	NSV	--	--	
2-Nitrophenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
3,3'-Dichlorobenzidine	NSV	--	--	
3-Nitroaniline	NSV	--	--	
4,6-Dinitro-2-methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Bromophenyl-phenylether	NSV	--	--	
4-Chloro-3-methylphenol	500	ug/kg	Beyer 1990; CCME 2007	B value; IRC

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Chemical	Screening Value	Units	Reference	Comments
4-Chloroaniline	500	ug/kg	MHSPE 2000	Geomean of target/intervention
4-Chlorophenyl-phenylether	NSV	--	--	
4-Methylphenol	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
4-Nitroaniline	NSV	--	--	
4-Nitrophenol	380	ug/kg	Efroymson et al. 1997b	LC50 of 38,000; UF of 100
Acenaphthene	LMW PAH	--	--	
Acenaphthylene	LMW PAH	--	--	
Acetophenone	NSV	--	--	
Anthracene	LMW PAH	--	--	
Atrazine	11.9	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Benzaldehyde	NSV	--	--	
Benzo(a)anthracene	HMW PAH	--	--	
Benzo(a)pyrene	HMW PAH	--	--	
Benzo(b)fluoranthene	HMW PAH	--	--	
Benzo(g,h,i)perylene	HMW PAH	--	--	
Benzo(k)fluoranthene	HMW PAH	--	--	
Benzoic acid	NSV	--	--	
Benzyl alcohol	NSV	--	--	
bis(2-Chloroethoxy)methane	NSV	--	--	
bis(2-Chloroethyl)ether	NSV	--	--	
bis(2-Ethylhexyl)phthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Butylbenzylphthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Caprolactam	NSV	--	--	
Carbazole	NSV	--	--	
Chrysene	HMW PAH	--	--	
Dibenz(a,h)anthracene	HMW PAH	--	--	
Dibenzofuran	NSV	--	--	
Diethylphthalate	26,800	ug/kg	Efroymson et al. 1997a	EC50 (134,000); UF of 5
Dimethyl phthalate	10,640	ug/kg	Efroymson et al. 1997b	LC50 of 1,064,000; UF of 100
Di-n-butylphthalate	40,000	ug/kg	Efroymson et al. 1997a	LOEC (200,000); UF of 5
Di-n-octylphthalate	30,000	ug/kg	CCME 2007	Plant; IRC
Fluoranthene	LMW PAH	--	--	

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Chemical	Screening Value	Units	Reference	Comments
Fluorene	LMW PAH	--	--	
Hexachlorobenzene	1,000	ug/kg	Beyer 1990	B value
Hexachlorobutadiene	NSV	--	--	
Hexachlorocyclopentadiene	2,000	ug/kg	Efroymson et al. 1997a	LOEC (10,000); UF of 5
Hexachloroethane	NSV	--	--	
Indeno(1,2,3-cd)pyrene	HMW PAH	--	--	
Isophorone	NSV	--	--	
Naphthalene	LMW PAH	--	--	
Nitrobenzene	2,260	ug/kg	Efroymson et al. 1997b	LC50 of 226,000; UF of 100
n-Nitroso-di-n-propylamine	NSV	--	--	
n-Nitrosodiphenylamine	1,090	ug/kg	Efroymson et al. 1997b	LC50 of 109,000; UF of 100
PAH (HMW)	18,000	ug/kg	USEPA 2007f	Eco-SSL - Invertebrate
PAH (LMW)	29,000	ug/kg	USEPA 2007f	Eco-SSL - Invertebrate
Pentachlorophenol	5,000	ug/kg	USEPA 2007g	Eco-SSL - Plant
Phenanthrene	LMW PAH	--	--	
Phenol	1,880	ug/kg	Efroymson et al. 1997b	LC50 of 188,000; UF of 100
Pyrene	HMW PAH	--	--	
Volatile Organic Compounds				
1,1,1-Trichloroethane	1,025	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1,2,2-Tetrachloroethane	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	--	--	
1,1,2-Trichloroethane	2,000	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1-Dichloroethane	548	ug/kg	MHSPE 2000	Geomean of target/intervention
1,1-Dichloroethene	173	ug/kg	MHSPE 2000	Geomean of target/intervention
1,2,3-Trichlorobenzene	1,150	ug/kg	Efroymson et al. 1997b	LC50 of 115,000; UF of 100
1,2,4-Trichlorobenzene	1,270	ug/kg	Efroymson et al. 1997b	LC50 of 127,000; UF of 100
1,2-Dibromo-3-chloropropane	NSV	--	--	
1,2-Dibromoethane	300	ug/kg	CCME 2007	IRC
1,2-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
1,2-Dichloroethane	2,190	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
1,2-Dichloropropane	38,800	ug/kg	Efroymson et al. 1997b	LC50 of 3,880,000; UF of 100
1,3-Dichlorobenzene	1,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC

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Chemical	Screening Value	Units	Reference	Comments
1,4-Dichlorobenzene	1,280	ug/kg	Efroymson et al. 1997b	LC50 of 128,000; UF of 100
2-Butanone	NSV	--	--	
2-Hexanone	NSV	--	--	
4-Methyl-2-pentanone	NSV	--	--	
Acetone	NSV	--	--	
Benzene	1,140	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Bromochloromethane	NSV	--	--	
Bromodichloromethane	NSV	--	--	
Bromoform	300	ug/kg	CCME 2007	Plant; IRC
Bromomethane	NSV	--	--	
Carbon disulfide	NSV	--	--	
Carbon tetrachloride	3,400	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Chlorobenzene	2,400	ug/kg	Efroymson et al. 1997b	LC50 of 240,000; UF of 100
Chloroethane	5,000	ug/kg	CCME 2007	IRC
Chloroform	1,844	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Chloromethane	5,000	ug/kg	CCME 2007	IRC
cis-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
cis-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC
Cumene (isopropylbenzene)	NSV	--	--	
Cyclohexane	6,000	ug/kg	Beyer 1990	B value
Dibromochloromethane	NSV	--	--	
Dichlorodifluoromethane(Freon-12)	NSV	--	--	
Ethylbenzene	1,815	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Methyl acetate	NSV	--	--	
Methylcyclohexane	NSV	--	--	
Methylene chloride	1,250	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Methyl-tert-butyl ether (MTBE)	NSV	--	--	
Styrene	64,000	ug/kg	Efroymson et al. 1997a	EC50 (320,000); UF of 5
Tetrachloroethene	179	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Toluene	40,000	ug/kg	Efroymson et al. 1997a	EC50 (200,000); UF of 5
trans-1,2-Dichloroethene	447	ug/kg	MHSPE 2000	Geomean of target/intervention
trans-1,3-Dichloropropene	5,000	ug/kg	Beyer 1990; CCME 2007	B value; IRC

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Chemical	Screening Value	Units	Reference	Comments
Trichloroethene	500	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Trichlorofluoromethane(Freon-11)	NSV	--	--	
Vinyl chloride	412	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC
Xylene, total	1,300	ug/kg	MHSPE 2000; 2001	Geomean of target/SRC

NSV - No Screening Value

TABLE B-2
Ecological Screening Values - Water
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh						Marine			
	Screening Value	Units	Hardness (mg/L)	pH	Reference	Comments	Screening Value	Units	Reference	Comments
Explosives										
1,3,5-Trinitrobenzene	11.0	ug/L			Talmage et al. 1999	SCV	15.0	ug/L	Nipper et al. 2001	NOEC; algae
1,3-Dinitrobenzene	17.0	ug/L			Talmage et al. 1999	SCV	180	ug/L	Nipper et al. 2001	NOEC; algae
2,4,6-Trinitrotoluene	93.0	ug/L			Talmage et al. 1999	SCV	100	ug/L	USEPA 2006b	
2,4-Dinitrotoluene	44.0	ug/L			USEPA 2006b	SCV	480	ug/L	Nipper et al. 2001	NOEC; algae
2,6-Dinitrotoluene	81.0	ug/L			USEPA 2006b	SCV	1,000	ug/L	Nipper et al. 2001	NOEC; algae
2-Amino-4,6-dinitrotoluene	19.0	ug/L			Talmage et al. 1999	SCV	NSV	--	--	
2-Nitrotoluene	3,400	ug/L			NAVFAC 2007		NSV	--	--	
3,5-Dinitroaniline	59.0	ug/L			Talmage et al. 1999	SCV	NSV	--	--	
3-Nitrotoluene	750	ug/L			USEPA 2006b		NSV	--	--	
4-Amino-2,6-dinitrotoluene	19.0	ug/L			2-Amino-4,6-dinitrotoluene		NSV	--	--	
4-Nitrotoluene	1,900	ug/L			USEPA 2006b		NSV	--	--	
HMX	330	ug/L			Talmage et al. 1999	SCV	NSV	--	--	
Nitrobenzene	270	ug/L			USEPA 2001	Acute/10	66.8	ug/L	USEPA 2001	
Nitroglycerine	138	ug/L			USEPA 2006b		NSV	--	--	
Nitroguanidine	220	ug/L			NAVFAC 2007	NOEC	NSV	--	--	
Perchlorate	9,300	ug/L			Dean et al. 2004	CCC	NSV	--	--	
PETN	85,000	ug/L			USEPA 2006b		NSV	--	--	
RDX	186	ug/L			Talmage et al. 1999	SCV	5,000	ug/L	Nipper et al. 2001	NOEC; algae
Tetryl	NSV	--			--		8.00	ug/L	Nipper et al. 2001	NOEC; polychaete
Dissolved Metals										
Aluminum	87.0	ug/L			USEPA 2009	AWQC	NSV	--	--	
Antimony	30.0	ug/L			Suter and Tsao 1996	FCV	500	ug/L	USEPA 2006b	
Arsenic	150	ug/L			USEPA 2009	AWQC	36.0	ug/L	USEPA 2009	AWQC
Barium	4.00	ug/L			Suter and Tsao 1996	SCV	200	ug/L	Buchman 2008	
Beryllium	0.66	ug/L			Suter and Tsao 1996	SCV	100	ug/L	Buchman 2008	
Cadmium	0.25	ug/L	100		USEPA 2009	AWQC	8.80	ug/L	USEPA 2009	AWQC
Chromium	11.0	ug/L			USEPA 2009	AWQC	50.0	ug/L	USEPA 2009	AWQC
Cobalt	23.0	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
Copper	8.96	ug/L	100		USEPA 2006a	AWQC	3.10	ug/L	USEPA 2009	AWQC
Iron	1,000	ug/L			USEPA 2009	AWQC	NSV	--	--	
Lead	2.52	ug/L	100		USEPA 2009	AWQC	8.10	ug/L	USEPA 2009	AWQC
Manganese	120	ug/L			Suter and Tsao 1996	SCV	100	ug/L	Buchman 2008	
Mercury	0.77	ug/L			USEPA 2009	AWQC	0.94	ug/L	USEPA 2009	AWQC
Nickel	52.0	ug/L	100		USEPA 2009	AWQC	8.20	ug/L	USEPA 2009	AWQC

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Ecological Screening Values - Water
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Williamsburg, Virginia

Chemical	Fresh						Marine			
	Screening Value	Units	Hardness (mg/L)	pH	Reference	Comments	Screening Value	Units	Reference	Comments
Selenium	4.61	ug/L			USEPA 2009	AWQC	71.0	ug/L	USEPA 2009	AWQC
Silver	0.36	ug/L			Suter and Tsao 1996	SCV	0.23	ug/L	USEPA 2001	
Thallium	12.0	ug/L			Suter and Tsao 1996	SCV	21.3	ug/L	USEPA 2001	
Vanadium	20.0	ug/L			Suter and Tsao 1996	SCV	50.0	ug/L	Buchman 2008	
Zinc	118	ug/L	100		USEPA 2009	AWQC	81.0	ug/L	USEPA 2009	AWQC
Inorganics (Total)										
Aluminum	87.0	ug/L			USEPA 2009	AWQC	NSV	--	--	
Antimony	30.0	ug/L			Suter and Tsao 1996	FCV	500	ug/L	USEPA 2006b	
Arsenic	150	ug/L			USEPA 2009	AWQC	36.0	ug/L	USEPA 2009	AWQC
Barium	4.00	ug/L			Suter and Tsao 1996	SCV	200	ug/L	Buchman 2008	
Beryllium	0.66	ug/L			Suter and Tsao 1996	SCV	100	ug/L	Buchman 2008	
Cadmium	0.27	ug/L	100		USEPA 2009	AWQC	8.85	ug/L	USEPA 2009	AWQC
Chromium	11.4	ug/L			USEPA 2009	AWQC	50.4	ug/L	USEPA 2009	AWQC
Cobalt	23.0	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
Copper	9.33	ug/L	100		USEPA 2006a	AWQC	3.73	ug/L	USEPA 2009	AWQC
Cyanide	5.20	ug/L			USEPA 2009	AWQC	1.00	ug/L	USEPA 2009	AWQC
Iron	1,000	ug/L			USEPA 2009	AWQC	NSV	--	--	
Lead	3.18	ug/L	100		USEPA 2009	AWQC	8.52	ug/L	USEPA 2009	AWQC
Manganese	120	ug/L			Suter and Tsao 1996	SCV	100	ug/L	Buchman 2008	
Mercury	0.91	ug/L			USEPA 2009	AWQC	1.11	ug/L	USEPA 2009	AWQC
Nickel	52.2	ug/L	100		USEPA 2009	AWQC	8.28	ug/L	USEPA 2009	AWQC
Selenium	5.00	ug/L			USEPA 2009	AWQC	71.1	ug/L	USEPA 2009	AWQC
Silver	0.36	ug/L			Suter and Tsao 1996	SCV	0.23	ug/L	USEPA 2001	
Thallium	12.0	ug/L			Suter and Tsao 1996	SCV	21.3	ug/L	USEPA 2001	
Vanadium	20.0	ug/L			Suter and Tsao 1996	SCV	50.0	ug/L	Buchman 2008	
Zinc	120	ug/L	100		USEPA 2009	AWQC	85.6	ug/L	USEPA 2009	AWQC
Pesticides/PCBs										
4,4'-DDD	0.011	ug/L			Suter and Tsao 1996	SCV	0.025	ug/L	USEPA 2001	
4,4'-DDE	0.013	ug/L			DDT value		0.14	ug/L	USEPA 2001	
4,4'-DDT	0.013	ug/L			USEPA 1996	SCV	0.0065	ug/L	USEPA 2006b	
Aldrin	0.30	ug/L			USEPA 2001	Acute AWQC/10	0.13	ug/L	USEPA 2001	
alpha-BHC	2.20	ug/L			Suter and Tsao 1996	SCV	25.0	ug/L	USEPA 2006b	
alpha-Chlordane	0.17	ug/L			Suter and Tsao 1996	SCV	0.004	ug/L	USEPA 2009	FRV - AWQC
Aroclor-1016	0.14	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC
Aroclor-1221	0.28	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC
Aroclor-1232	0.58	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC

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Chemical	Fresh						Marine			
	Screening Value	Units	Hardness (mg/L)	pH	Reference	Comments	Screening Value	Units	Reference	Comments
Aroclor-1242	0.053	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC
Aroclor-1248	0.081	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC
Aroclor-1254	0.033	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC
Aroclor-1260	0.14	ug/L			Suter and Tsao 1996	SCV	0.03	ug/L	USEPA 2009	FRV - AWQC
beta-BHC	2.20	ug/L			Suter and Tsao 1996	SCV	25.0	ug/L	alpha-BHC	
delta-BHC	2.20	ug/L			Suter and Tsao 1996	SCV	25.0	ug/L	alpha-BHC	
Dieldrin	0.056	ug/L			USEPA 2009	AWQC - FCV	0.11	ug/L	USEPA 1996	FCV
Endosulfan I	0.056	ug/L			USEPA 2009	AWQC	0.0087	ug/L	USEPA 2009	AWQC
Endosulfan II	0.056	ug/L			USEPA 2009	AWQC	0.0087	ug/L	USEPA 2009	AWQC
Endosulfan sulfate	0.056	ug/L			Endosulfan value		0.0087	ug/L	USEPA 2009	AWQC
Endrin	0.036	ug/L			USEPA 2009	AWQC - FCV	0.01	ug/L	USEPA 1996	FCV
Endrin aldehyde	0.15	ug/L			Buchman 2008		0.01	ug/L	Endrin	
Endrin ketone	0.15	ug/L			Endrin aldehyde value		0.01	ug/L	Endrin	
gamma-BHC (Lindane)	0.08	ug/L			USEPA 1996	FCV	0.016	ug/L	USEPA 2001	
gamma-Chlordane	0.17	ug/L			Suter and Tsao 1996	SCV	0.004	ug/L	USEPA 2009	FRV - AWQC
Heptachlor	0.0069	ug/L			USEPA 1996	SCV	0.0036	ug/L	USEPA 2009	FRV - AWQC
Heptachlor epoxide	0.0069	ug/L			Heptachlor value		0.0036	ug/L	USEPA 2009	FRV - AWQC
Methoxychlor	0.03	ug/L			USEPA 2009	AWQC	0.03	ug/L	USEPA 2009	AWQC
Toxaphene	0.011	ug/L			USEPA 1996	SCV	0.21	ug/L	USEPA 1996	FCV
Semivolatile Organic Compounds										
1,1-Biphenyl	14.0	ug/L			USEPA 1996	SCV	NSV	--	--	
1,2,3-Trichlorobenzene	8.00	ug/L			USEPA 2006b		NSV	--	--	
1,2,4-Trichlorobenzene	110	ug/L			Suter and Tsao 1996	SCV	5.40	ug/L	USEPA 2006b	
1,2-Dichlorobenzene	14.0	ug/L			USEPA 1996	SCV	42.0	ug/L	USEPA 2006b	
1,3-Dichlorobenzene	71.0	ug/L			USEPA 1996	SCV	28.5	ug/L	USEPA 2001	
1,4-Dichlorobenzene	15.0	ug/L			USEPA 1996	SCV	19.9	ug/L	USEPA 2001	
2,2'-Oxybis(1-chloropropane)	NSV	--			--		NSV	--	--	
2,4,5-Trichlorophenol	63.0	ug/L			Buchman 2008		12.0	ug/L	USEPA 2006b	
2,4,6-Trichlorophenol	4.90	ug/L			Buchman 2008		61.0	ug/L	USEPA 2006b	
2,4-Dichlorophenol	11.0	ug/L			USEPA 2006b	SCV	NSV	--	--	
2,4-Dimethylphenol	100	ug/L			Buchman 2008		NSV	--	--	
2,4-Dinitrophenol	19.0	ug/L			Buchman 2008		48.5	ug/L	USEPA 2001	
2,4-Dinitrotoluene	44.0	ug/L			USEPA 2006b	SCV	480	ug/L	Nipper et al. 2001	NOEC; algae
2,6-Dinitrotoluene	81.0	ug/L			USEPA 2006b	SCV	1,000	ug/L	Nipper et al. 2001	NOEC; algae
2-Chloronaphthalene	0.40	ug/L			Buchman 2008		NSV	--	--	
2-Chlorophenol	24.0	ug/L			USEPA 2006b	FCV	265	ug/L	USEPA 2006b	

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Ecological Screening Values - Water
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Chemical	Fresh						Marine			
	Screening Value	Units	Hardness (mg/L)	pH	Reference	Comments	Screening Value	Units	Reference	Comments
2-Methylnaphthalene	330	ug/L			Buchman 2008		NSV	--	--	
2-Methylphenol	13.0	ug/L			Suter and Tsao 1996	SCV	1,020	ug/L	USEPA 2006	
2-Nitroaniline	NSV	--			--		NSV	--	--	
2-Nitrophenol	1,920	ug/L			USEPA 2006b		2,940	ug/L	USEPA 2006b	
3,3'-Dichlorobenzidine	4.50	ug/L			USEPA 2006b	FCV	73.0	ug/L	USEPA 2006b	
3-Nitroaniline	NSV	--			--		NSV	--	--	
4,6-Dinitro-2-methylphenol	2.30	ug/L			USEPA 2001		NSV	--	--	
4-Bromophenyl-phenylether	1.50	ug/L			USEPA 1996	SCV	NSV	--	--	
4-Chloro-3-methylphenol	0.30	ug/L			USEPA 2001		NSV	--	--	
4-Chloroaniline	232	ug/L			USEPA 2006b		NSV	--	--	
4-Chlorophenyl-phenylether	NSV	--			--		NSV	--	--	
4-Methylphenol	543	ug/L			USEPA 2006b		NSV	--	--	
4-Nitroaniline	NSV	--			--		NSV	--	--	
4-Nitrophenol	300	ug/L			Suter and Tsao 1996	SCV	71.7	ug/L	USEPA 2001	
Acenaphthene	23.0	ug/L			USEPA 1996	FCV	40.0	ug/L	USEPA 1996	FCV
Acenaphthylene	4,840	ug/L			Buchman 2008		NSV	--	--	
Acetophenone	NSV	--			--		NSV	--	--	
Anthracene	0.73	ug/L			Suter and Tsao 1996	SCV	0.18	ug/L	USEPA 2006b	
Atrazine	1.80	ug/L			USEPA 2006b		10.0	ug/L	Buchman 2008	
Benzaldehyde	NSV	--			--		NSV	--	--	
Benzo(a)anthracene	0.027	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
Benzo(a)pyrene	0.014	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
Benzo(b)fluoranthene	9.07	ug/L			Buchman 2008		NSV	--	--	
Benzo(g,h,i)perylene	7.64	ug/L			Buchman 2008		NSV	--	--	
Benzo(k)fluoranthene	9.07	ug/L			Benzo(b)fluoranthene value		NSV	--	--	
Benzoic acid	42.0	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
Benzyl alcohol	8.60	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
bis(2-Chloroethoxy)methane	NSV	--			--		NSV	--	--	
bis(2-Chloroethyl)ether	1,900	ug/L			Buchman 2008		NSV	--	--	
bis(2-Ethylhexyl)phthalate	32.0	ug/L			USEPA 1996	SCV	360	ug/L	Buchman 2008	
Butylbenzylphthalate	19.0	ug/L			USEPA 1996	SCV	29.4	ug/L	USEPA 2001	
Caprolactam	NSV	--			--		NSV	--	--	
Carbazole	NSV	--			--		NSV	--	--	
Chrysene	NSV	--			--		NSV	--	--	
Dibenz(a,h)anthracene	NSV	--			--		NSV	--	--	
Dibenzofuran	3.70	ug/L			Suter and Tsao 1996	SCV	65.0	ug/L	USEPA 2006b	

TABLE B-2
Ecological Screening Values - Water
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh						Marine			
	Screening Value	Units	Hardness (mg/L)	pH	Reference	Comments	Screening Value	Units	Reference	Comments
Diethylphthalate	270	ug/L			USEPA 2008	SCV	75.9	ug/L	USEPA 2001	
Dimethyl phthalate	330	ug/L			USEPA 2001		580	ug/L	USEPA 2001	
Di-n-butylphthalate	35.0	ug/L			Suter and Tsao 1996	SCV	3.40	ug/L	USEPA 2001	
Di-n-octylphthalate	22.0	ug/L			USEPA 2006b		NSV	--	--	
Fluoranthene	8.10	ug/L			USEPA 1996	FCV	11.0	ug/L	USEPA 1996	FCV
Fluorene	3.90	ug/L			USEPA 1996	SCV	NSV	--	--	
Hexachlorobenzene	3.68	ug/L			Buchman 2008		NSV	--	--	
Hexachlorobutadiene	1.30	ug/L			USEPA 2006b		0.32	ug/L	USEPA 2001	
Hexachlorocyclopentadiene	1.04	ug/L			Buchman 2008	LOEL/5	0.07	ug/L	USEPA 2001	
Hexachloroethane	12.0	ug/L			USEPA 1996	SCV	9.40	ug/L	USEPA 2001	
Indeno(1,2,3-cd)pyrene	4.31	ug/L			Buchman 2008		NSV	--	--	
Isophorone	1,170	ug/L			USEPA 2001		129	ug/L	USEPA 2001	
Naphthalene	12.0	ug/L			Suter and Tsao 1996	SCV	23.5	ug/L	USEPA 2001	
Nitrobenzene	270	ug/L			USEPA 2001	Acute/10	66.8	ug/L	USEPA 2001	
n-Nitroso-di-n-propylamine	NSV	--			--		120	ug/L	USEPA 2006b	
n-Nitrosodiphenylamine	210	ug/L			Suter and Tsao 1996	SCV	33,000	ug/L	USEPA 2001	
Pentachlorophenol	15.0	ug/L		7.8	USEPA 2009	AWQC	7.90	ug/L	USEPA 2009	AWQC
Phenanthrene	6.30	ug/L			USEPA 1996	FCV	8.30	ug/L	USEPA 1996	FCV
Phenol	110	ug/L			Suter and Tsao 1996	SCV	58.0	ug/L	USEPA 2001	
Pyrene	0.025	ug/L			USEPA 2006b		0.24	ug/L	USEPA 2006b	
Volatile Organic Compounds										
1,1,1-Trichloroethane	11.0	ug/L			Suter and Tsao 1996	SCV	312	ug/L	USEPA 2001	
1,1,2,2-Tetrachloroethane	610	ug/L			Suter and Tsao 1996	SCV	90.2	ug/L	USEPA 2001	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	--			--		NSV	--	--	
1,1,2-Trichloroethane	1,200	ug/L			Suter and Tsao 1996	SCV	550	ug/L	USEPA 2006b	
1,1-Dichloroethane	47.0	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
1,1-Dichloroethene	25.0	ug/L			Suter and Tsao 1996	SCV	2,240	ug/L	USEPA 2001	
1,2,3-Trichlorobenzene	8.00	ug/L			USEPA 2006b		NSV	--	--	
1,2,4-Trichlorobenzene	110	ug/L			Suter and Tsao 1996	SCV	5.40	ug/L	USEPA 2006b	
1,2-Dibromo-3-chloropropane	NSV	--			--		NSV	--	--	
1,2-Dibromoethane	NSV	--			--		NSV	--	--	
1,2-Dichlorobenzene	14.0	ug/L			USEPA 1996	SCV	42.0	ug/L	USEPA 2006b	
1,2-Dichloroethane	910	ug/L			Suter and Tsao 1996	SCV	1,130	ug/L	USEPA 2001	
1,2-Dichloropropane	525	ug/L			USEPA 2001		2,400	ug/L	USEPA 2001	
1,3-Dichlorobenzene	71.0	ug/L			USEPA 1996	SCV	28.5	ug/L	USEPA 2001	
1,4-Dichlorobenzene	15.0	ug/L			USEPA 1996	SCV	19.9	ug/L	USEPA 2001	

TABLE B-2
Ecological Screening Values - Water
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh						Marine			
	Screening Value	Units	Hardness (mg/L)	pH	Reference	Comments	Screening Value	Units	Reference	Comments
2-Butanone	14,000	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
2-Hexanone	99.0	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
4-Methyl-2-pentanone	170	ug/L			Suter and Tsao 1996	SCV	123,000	ug/L	USEPA 2006b	
Acetone	1,500	ug/L			Suter and Tsao 1996	SCV	564,000	ug/L	USEPA 2006b	
Benzene	130	ug/L			Suter and Tsao 1996	SCV	110	ug/L	USEPA 2006b	
Bromochloromethane	NSV	--			--		NSV	--	--	
Bromodichloromethane	NSV	--			--		NSV	--	--	
Bromoform	320	ug/L			USEPA 1996	SCV	640	ug/L	USEPA 2001	
Bromomethane	110	ug/L			USEPA 2001		120	ug/L	USEPA 2001	
Carbon disulfide	0.92	ug/L			Suter and Tsao 1996	SCV	NSV	--	--	
Carbon tetrachloride	240	ug/L			USEPA 1996	SCV	1,500	ug/L	USEPA 2001	
Chlorobenzene	64.0	ug/L			Suter and Tsao 1996	SCV	25.0	ug/L	USEPA 2006b	
Chloroethane	NSV	--			--		NSV	--	--	
Chloroform	28.0	ug/L			Suter and Tsao 1996	SCV	815	ug/L	USEPA 2001	
Chloromethane	5,500	ug/L			USEPA 2001		2,700	ug/L	USEPA 2001	
cis-1,2-Dichloroethene	590	ug/L			Suter and Tsao 1996	SCV	680	ug/L	USEPA 2006b	
cis-1,3-Dichloropropene	24.4	ug/L			USEPA 2001		7.90	ug/L	USEPA 2001	
Cumene (isopropylbenzene)	2.60	ug/L			USEPA 2006b		NSV	--	--	
Cyclohexane	NSV	--			--		NSV	--	--	
Dibromochloromethane	NSV	--			--		NSV	--	--	
Dichlorodifluoromethane(Freon-12)	NSV	--			--		NSV	--	--	
Ethylbenzene	290	ug/L			USEPA 1996	SCV	25.0	ug/L	USEPA 2006b	
Methyl acetate	NSV	--			--		NSV	--	--	
Methylcyclohexane	NSV	--			--		NSV	--	--	
Methylene chloride	2,200	ug/L			Suter and Tsao 1996	SCV	2,560	ug/L	USEPA 2001	
Methyl-tert-butyl ether (MTBE)	11,070	ug/L			USEPA 2006b		5,000	ug/L	Buchman 2008	
Styrene	72.0	ug/L			USEPA 2006b		910	ug/L	USEPA 2006b	
Tetrachloroethene	98.0	ug/L			Suter and Tsao 1996	SCV	45.0	ug/L	USEPA 2001	
Toluene	9.80	ug/L			Suter and Tsao 1996	SCV	215	ug/L	USEPA 2006b	
trans-1,2-Dichloroethene	590	ug/L			Suter and Tsao 1996	SCV	680	ug/L	USEPA 2006b	
trans-1,3-Dichloropropene	24.4	ug/L			USEPA 2001		7.90	ug/L	USEPA 2001	
Trichloroethene	47.0	ug/L			Suter and Tsao 1996	SCV	1,940	ug/L	USEPA 2006b	
Trichlorofluoromethane(Freon-11)	NSV	--			--		NSV	--	--	
Vinyl chloride	930	ug/L			USEPA 2006b	FCV	NSV	--	--	
Xylene, total	13.0	ug/L			Suter and Tsao 1996	SCV	19.0	ug/L	USEPA 2006b	

NSV - No Screening Value

TABLE B-3
Ecological Screening Values - Sediment
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
Explosives								
1,3,5-Trinitrobenzene	NSV	--	--		2.40	ug/kg	1	Talmage et al. 1999
1,3-Dinitrobenzene	NSV	--	--		6.70	ug/kg	1	Talmage et al. 1999
2,4,6-Trinitrotoluene	NSV	--	--		92.0	ug/kg	1	Talmage et al. 1999
2,4-Dinitrotoluene	NSV	--	--		41.6	ug/kg	1	USEPA 2006b
2,6-Dinitrotoluene	NSV	--	--		55.8	ug/kg	1	Calculated
2-Amino-4,6-dinitrotoluene	NSV	--	--		13.2	ug/kg	1	NAVFAC 2007
2-Nitrotoluene	NSV	--	--		6,204	ug/kg	1	NAVFAC 2007
3,5-Dinitroaniline	NSV	--	--		NSV	--		--
3-Nitrotoluene	NSV	--	--		1,922	ug/kg	1	NAVFAC 2007
4-Amino-2,6-dinitrotoluene	NSV	--	--		23.2	ug/kg	1	NAVFAC 2007
4-Nitrotoluene	NSV	--	--		4,062	ug/kg	1	USEPA 2006b
HMX	NSV	--	--		4.74	ug/kg	1	Talmage et al. 1999
Nitrobenzene	NSV	--	--		1,779	ug/kg	1	NAVFAC 2007
Nitroglycerine	NSV	--	--		NSV	--		--
Nitroguanidine	NSV	--	--		NSV	--		--
Perchlorate	NSV	--	--		NSV	--		--
PETN	NSV	--	--		NSV	--		--
RDX	NSV	--	--		12.7	ug/kg	1	Talmage et al. 1999
Tetryl	NSV	--	--		NSV	--		--
Inorganics								
Aluminum	25,500	mg/kg	Buchman 2008	ARCS TEL	N/A	--		--
Antimony	3.00	mg/kg	Buchman 2008	UET	N/A	--		--
Arsenic	9.79	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Barium	20.0	mg/kg	MacDonald et al. 2003	TEC	N/A	--		--
Beryllium	NSV	--	--		N/A	--		--
Cadmium	0.99	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Chromium	43.4	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Cobalt	50.0	mg/kg	Persuad et al. 1993	OWDG	N/A	--		--

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Ecological Screening Values - Sediment
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
Copper	31.6	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Cyanide	NSV	--	--		N/A	--		--
Iron	20,000	mg/kg	Persuad et al. 1993	LEL	N/A	--		--
Lead	35.8	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Manganese	460	mg/kg	Persuad et al. 1993	LEL	N/A	--		--
Mercury	0.18	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Nickel	22.7	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Selenium	2.00	mg/kg	USEPA 2006b		N/A	--		--
Silver	1.00	mg/kg	MacDonald et al. 2003	TEC	N/A	--		--
Thallium	NSV	--	--		N/A	--		--
Vanadium	57.0	mg/kg	Buchman 2008	AET	N/A	--		--
Zinc	121	mg/kg	MacDonald et al. 2000a	TEC	N/A	--		--
Pesticides/PCBs								
4,4'-DDD	4.88	ug/kg	MacDonald et al. 2000a	TEC	110	ug/kg	1	Jones et al. 1997
4,4'-DDE	3.16	ug/kg	MacDonald et al. 2000a	TEC	340	ug/kg	1	DDT value
4,4'-DDT	4.16	ug/kg	MacDonald et al. 2000a	TEC	340	ug/kg	1	Jones et al. 1997
Aldrin	2.00	ug/kg	Persuad et al. 1993	LEL	NSV	--		--
alpha-BHC	6.00	ug/kg	Persuad et al. 1993	LEL	120	ug/kg	1	Jones et al. 1997
alpha-Chlordane	3.24	ug/kg	MacDonald et al. 2000a	TEC	2,800	ug/kg	1	Jones et al. 1997
Aroclor-1016	59.8	ug/kg	MacDonald et al. 2000b	TEC	120	ug/kg	1	Aroclor-1221 value
Aroclor-1221	59.8	ug/kg	MacDonald et al. 2000b	TEC	120	ug/kg	1	Jones et al. 1997
Aroclor-1232	59.8	ug/kg	MacDonald et al. 2000b	TEC	600	ug/kg	1	Jones et al. 1997
Aroclor-1242	59.8	ug/kg	MacDonald et al. 2000b	TEC	170	ug/kg	1	Jones et al. 1997
Aroclor-1248	59.8	ug/kg	MacDonald et al. 2000b	TEC	1,000	ug/kg	1	Jones et al. 1997
Aroclor-1254	59.8	ug/kg	MacDonald et al. 2000b	TEC	810	ug/kg	1	Jones et al. 1997
Aroclor-1260	59.8	ug/kg	MacDonald et al. 2000b	TEC	810	ug/kg	1	Aroclor-1254 value
beta-BHC	5.00	ug/kg	Persuad et al. 1993	LEL	120	ug/kg	1	Jones et al. 1997
delta-BHC	3.00	ug/kg	Persuad et al. 1993	LEL	120	ug/kg	1	Jones et al. 1997
Dieldrin	1.90	ug/kg	MacDonald et al. 2000a	TEC	52.0	ug/kg	1	USEPA 1996

TABLE B-3
Ecological Screening Values - Sediment
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Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
Endosulfan I	NSV	--	--		2.90	ug/kg	1	USEPA 1996
Endosulfan II	NSV	--	--		14.0	ug/kg	1	USEPA 1996
Endosulfan sulfate	NSV	--	--		5.40	ug/kg	1	USEPA 1996
Endrin	2.22	ug/kg	MacDonald et al. 2000a	TEC	20.0	ug/kg	1	USEPA 1996
Endrin aldehyde	2.22	ug/kg	Endrin		20.0	ug/kg	1	Endrin
Endrin ketone	2.22	ug/kg	Endrin		20.0	ug/kg	1	Endrin
gamma-BHC (Lindane)	2.37	ug/kg	MacDonald et al. 2000a	TEC	3.70	ug/kg	1	USEPA 1996
gamma-Chlordane	3.24	ug/kg	MacDonald et al. 2000a	TEC	2,800	ug/kg	1	Jones et al. 1997
Heptachlor	NSV	--	--		68.0	ug/kg	1	Jones et al. 1997
Heptachlor epoxide	2.47	ug/kg	MacDonald et al. 2000a	TEC	68.0	ug/kg	1	Heptachlor
Methoxychlor	NSV	--	--		19.0	ug/kg	1	USEPA 1996
Toxaphene	NSV	--	--		28.0	ug/kg	1	USEPA 1996
Semivolatile Organic Compounds								
1,1-Biphenyl	NSV	--	--		1,100	ug/kg	1	USEPA 1996
1,2,3-Trichlorobenzene	NSV	--	--		858	ug/kg	1	USEPA 2006b
1,2,4-Trichlorobenzene	NSV	--	--		9,200	ug/kg	1	USEPA 1996
1,2-Dichlorobenzene	NSV	--	--		340	ug/kg	1	USEPA 1996
1,3-Dichlorobenzene	NSV	--	--		1,700	ug/kg	1	USEPA 1996
1,4-Dichlorobenzene	NSV	--	--		350	ug/kg	1	USEPA 1996
2,2'-Oxybis(1-chloropropane)	NSV	--	--		NSV	--		--
2,4,5-Trichlorophenol	NSV	--	--		NSV	--		--
2,4,6-Trichlorophenol	NSV	--	--		213	ug/kg	1	USEPA 2006b
2,4-Dichlorophenol	NSV	--	--		117	ug/kg	1	USEPA 2006b
2,4-Dimethylphenol	NSV	--	--		NSV	--		--
2,4-Dinitrophenol	NSV	--	--		NSV	--		--
2,4-Dinitrotoluene	NSV	--	--		41.6	ug/kg	1	USEPA 2006b
2,6-Dinitrotoluene	NSV	--	--		NSV	--		--
2-Chloronaphthalene	NSV	--	--		NSV	--		--
2-Chlorophenol	NSV	--	--		31.2	ug/kg	1	USEPA 2006b

TABLE B-3
Ecological Screening Values - Sediment
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Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
2-Methylnaphthalene	NSV	--	--		NSV	--		--
2-Methylphenol	NSV	--	--		NSV	--		--
2-Nitroaniline	NSV	--	--		NSV	--		--
2-Nitrophenol	NSV	--	--		NSV	--		--
3,3'-Dichlorobenzidine	NSV	--	--		127	ug/kg	1	USEPA 2006b
3-Nitroaniline	NSV	--	--		NSV	--		--
4,6-Dinitro-2-methylphenol	NSV	--	--		NSV	--		--
4-Bromophenyl-phenylether	NSV	--	--		1,300	ug/kg	1	USEPA 1996
4-Chloro-3-methylphenol	NSV	--	--		NSV	--		--
4-Chloroaniline	NSV	--	--		NSV	--		--
4-Chlorophenyl-phenylether	NSV	--	--		NSV	--		--
4-Methylphenol	NSV	--	--		NSV	--		--
4-Nitroaniline	NSV	--	--		NSV	--		--
4-Nitrophenol	NSV	--	--		NSV	--		--
Acenaphthene	290	ug/kg	Buchman 2008	UET	620	ug/kg	1	USEPA 1996
Acenaphthylene	160	ug/kg	Buchman 2008	UET	NSV	--		--
Acetophenone	NSV	--	--		NSV	--		--
Anthracene	57.2	ug/kg	MacDonald et al. 2000a	TEC	220	ug/kg	1	Jones et al. 1997
Atrazine	NSV	--	--		6.62	ug/kg	1	USEPA 2006b
Benzaldehyde	NSV	--	--		NSV	--		--
Benzo(a)anthracene	108	ug/kg	MacDonald et al. 2000a	TEC	110	ug/kg	1	Jones et al. 1997
Benzo(a)pyrene	150	ug/kg	MacDonald et al. 2000a	TEC	140	ug/kg	1	Jones et al. 1997
Benzo(b)fluoranthene	240	ug/kg	Benzo(k)fluoanthene value		NSV	--		--
Benzo(g,h,i)perylene	170	ug/kg	Persuad et al. 1993	LEL	NSV	--		--
Benzo(k)fluoranthene	240	ug/kg	Persuad et al. 1993	LEL	NSV	--		--
Benzoic acid	NSV	--	--		NSV	--		--
Benzyl alcohol	NSV	--	--		NSV	--		--
bis(2-Chloroethoxy)methane	NSV	--	--		NSV	--		--
bis(2-Chloroethyl)ether	NSV	--	--		NSV	--		--

TABLE B-3
Ecological Screening Values - Sediment
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Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
bis(2-Ethylhexyl)phthalate	750	ug/kg	Buchman 2008	UET	890,000	ug/kg	1	Jones et al. 1997
Butylbenzylphthalate	NSV	--	--		11,000	ug/kg	1	USEPA 1996
Caprolactam	NSV	--	--		NSV	--		--
Carbazole	NSV	--	--		NSV	--		--
Chrysene	166	ug/kg	MacDonald et al. 2000a	TEC	NSV	--		--
Dibenz(a,h)anthracene	33.0	ug/kg	MacDonald et al. 2000a	TEC	NSV	--		--
Dibenzofuran	5,100	ug/kg	Buchman 2008	UET	2,000	ug/kg	1	USEPA 1996
Diethylphthalate	630	ug/kg	MacDonald et al. 2003	TEC	770	ug/kg	1	USEPA 2008
Dimethyl phthalate	NSV	--	--		NSV	--		--
Di-n-butylphthalate	110	ug/kg	Buchman 2008	UET	11,000	ug/kg	1	USEPA 1996
Di-n-octylphthalate	NSV	--	--		11,000	ug/kg	1	Di-n-butylphthalate
Fluoranthene	423	ug/kg	MacDonald et al. 2000a	TEC	2,900	ug/kg	1	USEPA 1996
Fluorene	77.4	ug/kg	MacDonald et al. 2000a	TEC	540	ug/kg	1	USEPA 1996
Hexachlorobenzene	20.0	ug/kg	Persuad et al. 1993	LEL	NSV	--		--
Hexachlorobutadiene	NSV	--	--		550	ug/kg	1	MacDonald et al. 2003
Hexachlorocyclopentadiene	NSV	--	--		NSV	--		--
Hexachloroethane	NSV	--	--		1,000	ug/kg	1	USEPA 1996
Indeno(1,2,3-cd)pyrene	200	ug/kg	Persuad et al. 1993	LEL	NSV	--		--
Isophorone	NSV	--	--		NSV	--		--
Naphthalene	176	ug/kg	MacDonald et al. 2000a	TEC	480	ug/kg	1	USEPA 1996
Nitrobenzene	NSV	--	--		1,779	ug/kg	1	NAVFAC 2007
n-Nitroso-di-n-propylamine	NSV	--	--		NSV	--		--
n-Nitrosodiphenylamine	NSV	--	--		2,684	ug/kg	1	USEPA 2006b
PAH (total)	3,553	ug/kg	Jones et al. 1997	ARCS TEC	NSV	--		--
PAH (HMW)	2,900	ug/kg	Jones et al. 1997	ARCS TEC	NSV	--		--
PAH (LMW)	786	ug/kg	Jones et al. 1997	ARCS TEC	NSV	--		--
Pentachlorophenol	NSV	--	--		504	ug/kg	1	USEPA 2006b
Phenanthrene	204	ug/kg	MacDonald et al. 2000a	TEC	850	ug/kg	1	USEPA 1996
Phenol	48.0	ug/kg	Buchman 2008	UET	31.0	ug/kg	1	Jones et al. 1997

TABLE B-3
Ecological Screening Values - Sediment
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
Pyrene	195	ug/kg	MacDonald et al. 2000a	TEC	NSV	--		--
Volatile Organic Compounds								
1,1,1-Trichloroethane	NSV	--	--		170	ug/kg	1	USEPA 1996
1,1,2,2-Tetrachloroethane	NSV	--	--		940	ug/kg	1	USEPA 1996
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	--	--		NSV	--		--
1,1,2-Trichloroethane	NSV	--	--		1,200	ug/kg	1	Jones et al. 1997
1,1-Dichloroethane	NSV	--	--		27.0	ug/kg	1	Jones et al. 1997
1,1-Dichloroethene	NSV	--	--		31.0	ug/kg	1	Jones et al. 1997
1,2,3-Trichlorobenzene	NSV	--	--		858	ug/kg	1	USEPA 2006b
1,2,4-Trichlorobenzene	NSV	--	--		9,200	ug/kg	1	USEPA 1996
1,2-Dibromo-3-chloropropane	NSV	--	--		NSV	--		--
1,2-Dibromoethane	NSV	--	--		NSV	--		--
1,2-Dichlorobenzene	NSV	--	--		340	ug/kg	1	USEPA 1996
1,2-Dichloroethane	NSV	--	--		250	ug/kg	1	Jones et al. 1997
1,2-Dichloropropane	NSV	--	--		NSV	--		--
1,3-Dichlorobenzene	NSV	--	--		1,700	ug/kg	1	USEPA 1996
1,4-Dichlorobenzene	NSV	--	--		350	ug/kg	1	USEPA 1996
2-Butanone	NSV	--	--		NSV	--		--
2-Hexanone	NSV	--	--		NSV	--		--
4-Methyl-2-pentanone	NSV	--	--		NSV	--		--
Acetone	NSV	--	--		NSV	--		--
Benzene	NSV	--	--		57.0	ug/kg	1	USEPA 1996
Bromochloromethane	NSV	--	--		NSV	--		--
Bromodichloromethane	NSV	--	--		NSV	--		--
Bromoform	NSV	--	--		650	ug/kg	1	USEPA 1996
Bromomethane	NSV	--	--		NSV	--		--
Carbon disulfide	NSV	--	--		0.85	ug/kg	1	Jones et al. 1997
Carbon tetrachloride	NSV	--	--		1,200	ug/kg	1	USEPA 1996

TABLE B-3
Ecological Screening Values - Sediment
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Fresh Sediment Screening Level Concentration (SLC) Value		Reference	Comments	Fresh Sediment Equilibrium Partitioning (EqP) Value			Reference
	Screening Value	Units			Screening Value	Units	TOC (%)	
Chlorobenzene	NSV	--	--		820	ug/kg	1	USEPA 1996
Chloroethane	NSV	--	--		NSV	--		--
Chloroform	NSV	--	--		22.0	ug/kg	1	Jones et al. 1997
Chloromethane	NSV	--	--		NSV	--		--
cis-1,2-Dichloroethene	NSV	--	--		400	ug/kg	1	Jones et al. 1997
cis-1,3-Dichloropropene	NSV	--	--		0.051	ug/kg	1	Jones et al. 1997
Cumene (isopropylbenzene)	NSV	--	--		86.0	ug/kg	1	USEPA 2006b
Cyclohexane	NSV	--	--		NSV	--		--
Dibromochloromethane	NSV	--	--		NSV	--		--
Dichlorodifluoromethane(Freon-12)	NSV	--	--		NSV	--		--
Ethylbenzene	NSV	--	--		3,600	ug/kg	1	USEPA 1996
Methyl acetate	NSV	--	--		NSV	--		--
Methylcyclohexane	NSV	--	--		NSV	--		--
Methylene chloride	NSV	--	--		370	ug/kg	1	Jones et al. 1997
Methyl-tert-butyl ether (MTBE)	NSV	--	--		NSV	--		--
Styrene	NSV	--	--		559	ug/kg	1	USEPA 2006b
Tetrachloroethene	NSV	--	--		530	ug/kg	1	USEPA 1996
Toluene	NSV	--	--		670	ug/kg	1	USEPA 1996
trans-1,2-Dichloroethene	NSV	--	--		400	ug/kg	1	Jones et al. 1997
trans-1,3-Dichloropropene	NSV	--	--		0.051	ug/kg	1	Jones et al. 1997
Trichloroethene	NSV	--	--		1,600	ug/kg	1	USEPA 1996
Trichlorofluoromethane(Freon-11)	NSV	--	--		NSV	--		--
Vinyl chloride	NSV	--	--		NSV	--		--
Xylene, total	NSV	--	--		160	ug/kg	1	Jones et al. 1997

NSV - No Screening Value

TABLE B-3a
Uncertainty Factors
WPNSTA Cheatham Annex
Williamsburg, Virginia

Convert From	Convert To	Uncertainty Factor
Chronic NOAEL or NOEC	Chronic NOAEL or NOEC	1
Chronic LOAEL or LOEC	Chronic NOAEL or NOEC	5
Subchronic NOAEL or NOEC	Chronic NOAEL or NOEC	10
Subchronic LOAEL or LOEC	Chronic NOAEL or NOEC	20
Acute NOAEL or NOEC	Chronic NOAEL or NOEC	30
Acute LOAEL or LOEC	Chronic NOAEL or NOEC	50
LD50 or LC50	Chronic NOAEL or NOEC	100

Uncertainty factors from Wentsel et al. (1996)
Durations are defined as follows (USEPA 1999; Sample et al. 1996):
- Acute: <3 days (plants, invertebrates) and <14 days (fish, birds, mammals)
- Subchronic: 3 - 6 days (plants, invertebrates) and 14 - 90 days (fish, birds, mammals)
- Chronic: >7 days (plants, invertebrates) and >90 days or during critical life stage (fish, birds, mammals)

TABLE B-4

Ecological Screening Statistics - AOC 1 North Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
Styrene	12.0 - 17.0	2 / 11	3.00	3.00	CAA01-SS09-1108	5.91	1.63	6.80	5.66	64,000	0 / 11	0.00005	--	-- / --	--	NO	--	--	NO
Semivolatile Organic Compounds (UG/KG)																			
Benzaldehyde	380 - 560	2 / 11	230	260	CAA01-SS04-1108	220	29.9	236	218	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Benzo(a)anthracene	380 - 490	2 / 11	330	370	CAA01-SS11-1108	234	60.2	267	228	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(a)pyrene	380 - 490	2 / 11	300	750	CAA01-SS11-1108	265	164	355	241	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(b)fluoranthene	380 - 490	3 / 11	240	2,400	CAA01-SS11-1108	457	664	820	292	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(g,h,i)perylene	380 - 490	1 / 11	1,000	1,000	CAA01-SS11-1108	280	239	410	239	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(k)fluoranthene	380 - 490	2 / 11	540	820	CAA01-SS11-1108	294	202	404	256	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Chrysene	380 - 490	2 / 11	440	1,400	CAA01-SS11-1108	337	360	534	264	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Dibenz(a,h)anthracene	380 - 490	1 / 11	330	330	CAA01-SS11-1108	219	39.9	240	216	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Fluoranthene	380 - 560	1 / 11	440	440	CAA01-SS05-1108	235	72.8	275	228	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Indeno(1,2,3-cd)pyrene	380 - 490	1 / 11	750	750	CAA01-SS11-1108	257	164	347	233	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	1,710 - 2,205	3 / 11	2,040	8,110	CAA01-SS11-1108	1,942	2,232	3,162	1,375	18,000	0 / 11	0.45	--	-- / --	--	NO	--	--	NO
PAH (LMW)	1,710 - 2,520	1 / 11	2,080	2,080	CAA01-SS05-1108	1,069	356	1,263	1,031	29,000	0 / 11	0.07	--	-- / --	--	NO	--	--	NO
Pyrene	380 - 490	2 / 11	290	840	CAA01-SS05-1108	273	190	377	243	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	3.80 - 5.10	1 / 11	1.70	1.70	CAA01-SS08-1108	2.11	0.24	2.24	2.10	583	0 / 11	0.003	--	-- / --	--	NO	--	--	NO
4,4'-DDE	3.90 - 4.70	6 / 11	0.23	2.80	CAA01-SS08-1108	1.62	0.85	2.08	1.30	114	0 / 11	0.02	--	-- / --	--	NO	--	--	NO
4,4'-DDT	3.80 - 4.70	5 / 11	1.80	4.70	CAA01-SS11-1108	2.64	0.95	3.15	2.51	100	0 / 11	0.05	--	-- / --	--	NO	--	--	NO
Endosulfan I	1.90 - 2.60	1 / 11	0.29	0.29	CAA01-SS04-1108	0.99	0.26	1.14	0.94	6.32	0 / 11	0.05	--	-- / --	--	NO	--	--	NO
Endrin	3.80 - 4.70	2 / 11	2.70	3.30	CAA01-SS11-1108	2.27	0.41	2.49	2.24	1.95	2 / 11	1.69	--	-- / --	--	**YES**	1.28	1.16	**YES**
Endrin aldehyde	3.80 - 4.70	2 / 11	2.10	3.10	CAA01-SS11-1108	2.20	0.33	2.38	2.18	1.95	2 / 11	1.59	--	-- / --	--	**YES**	1.22	1.13	**YES**
gamma-Chlordane	1.90 - 2.60	2 / 11	1.90	2.00	CAA01-SS03-1208	1.24	0.37	1.44	1.20	11.0	0 / 11	0.18	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	11 / 11	5,880	18,200	CAA01-SS06-1108	8,955	3,425	10,827	8,514	pH < 5.5	1 / 11	--	12,200	1 / 11	1.49	**YES**	mean pH > 5.5		NO
Antimony	5.40 - 7.30	4 / 11	0.080	1.20	CAA01-SS04-1108	2.17	1.28	2.87	1.44	78.0	0 / 11	0.02	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	11 / 11	1.50	47.5	CAA01-SS04-1108	8.34	13.7	15.8	4.35	18.0	1 / 11	2.64	6.36	2 / 11	7.47	**YES**	0.88	0.46	NO
Barium	-- - --	11 / 11	19.3	124	CAA01-SS11-1108	48.1	30.3	64.6	41.7	330	0 / 11	0.38	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	11 / 11	0.23	0.78	CAA01-SS11-1108	0.48	0.15	0.56	0.46	40.0	0 / 11	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.010 - 0.49	6 / 11	0.080	1.30	CAA01-SS11-1108	0.25	0.38	0.46	0.095	32.0	0 / 11	0.04	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	11 / 11	317	24,300	CAA01-SS11-1108	6,495	8,210	10,982	3,153	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	11 / 11	5.30	48.7	CAA01-SS11-1108	15.0	12.2	21.6	12.3	64.0	0 / 11	0.76	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	11 / 11	1.10	9.00	CAA01-SS02-1108	3.48	2.04	4.60	3.06	13.0	0 / 11	0.69	--	-- / --	--	NO	--	--	NO
Copper	-- - --	11 / 11	2.20	33.0	CAA01-SS04-1108	8.13	9.36	13.2	5.44	70.0	0 / 11	0.47	--	-- / --	--	NO	--	--	NO
Cyanide	0.55 - 0.85	1 / 11	29.0	29.0	CAA01-SS04-1108	2.92	8.65	7.64	0.46	15.8	1 / 11	1.84	--	-- / --	--	**YES**	0.48	0.18	NO
Iron	-- - --	11 / 11	3,320	17,100	CAA01-SS16-1108	9,865	4,854	12,517	8,697	5 < pH > 8	2 / 11	--	19,900	0 / 11	0.86	NO	--	--	NO
Lead	-- - --	11 / 11	8.00	121	CAA01-SS11-1108	33.8	36.0	53.4	23.0	120	1 / 11	1.01	17.4	5 / 11	6.95	**YES**	0.45	0.28	NO
Magnesium [2]	-- - --	11 / 11	299	1,890	CAA01-SS11-1108	838	498	1,111	716	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	11 / 11	29.7	426	CAA01-SS11-1108	147	136	221	103	220	2 / 11	1.94	324	2 / 11	1.31	**YES**	1.00	0.67	NO
Mercury	0.040 - 0.13	3 / 11	0.070	0.15	CAA01-SS11-1108	0.063	0.036	0.083	0.054	0.10	1 / 11	1.50	0.111	1 / 11	1.35	**YES**	0.83	0.63	NO
Nickel	-- - --	11 / 11	2.80	8.90	CAA01-SS11-1108	4.94	1.79	5.92	4.67	38.0	0 / 11	0.23	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	11 / 11	236	893	CAA01-SS11-1108	530	197	637	496	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	3.20 - 4.90	1 / 11	0.31	0.31	CAA01-SS06-1108	1.69	0.53	1.98	1.54	0.52	0 / 11	0.60	--	-- / --	--	NO	--	--	NO
Silver	0.90 - 1.20	5 / 11	0.070	0.55	CAA01-SS11-1108	0.38	0.20	0.49	0.31	560	0 / 11	0.001	--	-- / --	--	NO	--	--	NO
Sodium [2]	17.7 - 64.1	5 / 11	18.5	48.1	CAA01-SS04-1108	23.7	13.1	30.8	20.6	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	11 / 11	10.7	40.8	CAA01-SS06-1108	18.2	8.68	22.9	16.8	130	0 / 11	0.31	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	11 / 11	11.3	872	CAA01-SS11-1108	132	260	274	45.9	120	2 / 11	7.27	26.5	8 / 11	32.9	**YES**	2.28	1.10	**YES**

TABLE B-4

Ecological Screening Statistics - AOC 1 North Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	11 / 11	9,200	140,000	CAA01-SS11-1108	48,836	40,129	70,766	37,457	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	11 / 11	5.30	8.40	CAA01-SS07-1108	7.10	0.93	7.61	7.04	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-5
Exceedances - AOC 1 North Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07	
Sample ID			CAA01-SS01-1108	CAA01-SS02-1108	CAA01-SS02P-1108	CAA01-SS03-1108	CAA01-SS03-1208	CAA01-SS04-1108	CAA01-SS05-1108	CAA01-SS06-1108	CAA01-SS06P-1108	CAA01-SS07-1108	CAA01-SS07-1208
Sample Date			11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08
Volatile Organic Compounds (UG/KG)													
Styrene	64,000	--	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA
Semivolatile Organic Compounds (UG/KG)													
Benzaldehyde	--	--	490 U	420 U	380 U	400 U	NA	**260 J**	**230 J**	400 U	400 U	400 U	NA
Benzo(a)anthracene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	**330 J**	400 U	400 U	400 U	NA
Benzo(a)pyrene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	**300 J**	400 U	400 U	400 U	NA
Benzo(b)fluoranthene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	**240 J**	**740**	400 U	400 U	400 U	NA
Benzo(g,h,i)perylene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA
Benzo(k)fluoranthene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	**540**	400 U	400 U	400 U	NA
Chrysene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	**440**	400 U	400 U	400 U	NA
Dibenz(a,h)anthracene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA
Fluoranthene	LMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	**440**	400 U	400 U	400 U	NA
Indeno(1,2,3-cd)pyrene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA
PAH (HMW)	18,000	--	2,205 U	1,890 U	1,710 U	1,800 U	NA	**2,040**	**3,805**	1,800 U	1,800 U	1,800 U	NA
PAH (LMW)	29,000	--	2,205 U	1,890 U	1,710 U	1,800 U	NA	2,025 U	**2,080**	1,800 U	1,800 U	1,800 U	NA
Pyrene	HMW PAH	--	490 U	420 U	380 U	400 U	NA	450 U	**840**	400 U	400 U	400 U	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	583	--	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 U	4.2 U	4.1 U	NA	3.9 U
4,4'-DDE	114	--	4.7 U	**0.23 J**	3.8 U	NA	**0.72 J**	**0.45 J**	**1.1 K**	4.2 U	4.1 U	NA	3.9 U
4,4'-DDT	100	--	4.7 U	3.8 U	3.8 U	NA	**3.5 J**	**1.8 J**	**2.6 J**	4.2 U	4.1 U	NA	3.9 U
Endosulfan I	6.32	--	2.4 U	1.9 U	1.9 U	NA	2.2 U	**0.29 J**	2 U	2.1 U	2 U	NA	2 U
Endrin	1.95	--	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	**2.7 K**	4.2 U	4.1 U	NA	3.9 U
Endrin aldehyde	1.95	--	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	**2.1 J**	4.2 U	4.1 U	NA	3.9 U
gamma-Chlordane	11.0	--	2.4 U	1.9 U	1.9 U	NA	**2 J**	2.3 U	2 U	2.1 U	2 U	NA	2 U
Explosives (UG/KG)													
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)													
Aluminum	pH < 5.5	12,200	**8,670**	**6,780**	**5,490**	**8,280**	NA	**8,400**	**5,880**	**18,200**	**12,200**	**8,510**	NA
Antimony	78.0	11.0	**0.08 L**	7.3 UL	5.2 UL	6.4 UL	NA	**1.2 L**	5.4 UL	**0.24 L**	**0.11 L**	5.6 UL	NA
Arsenic	18.0	6.36	**3.3 L**	**4.4 L**	**3.9 L**	**4.0 L**	NA	**47.5 L**	**2.4 L**	**2.5 L**	**1.6 L**	**2.1 L**	NA
Barium	330	52.9	**41.2**	**46.9**	**41.0**	**42.9 K**	NA	**82.0**	**49.6**	**30.3**	**25.2**	**30.3 K**	NA
Beryllium	40.0	0.587	**0.56**	**0.65**	**0.58**	**0.50 J**	NA	**0.54**	**0.39 J**	**0.23 J**	**0.17 J**	**0.48**	NA
Cadmium	32.0	1.50	**0.11 J**	**0.12 J**	**0.06 J**	0.01 B	NA	**0.56**	**0.12 J**	0.35 U	0.32 U	0.03 B	NA
Chromium	64.0	18.2	**11.2**	**8.1**	**6.7**	**11.6**	NA	**20.8**	**7.7**	**18.9**	**13.0**	**7.1**	NA
Cobalt	13.0	9.93	**3.5 J**	**9.0 J**	**7.9 J**	**3.3 J**	NA	**3.8 J**	**3.2 J**	**1.1 J**	**0.86 J**	**3.8 J**	NA
Copper	70.0	4.25	**4.7**	**3.9**	**3.0**	**8.9**	NA	**33.0**	**4.0**	**2.2**	**1.7**	**3.0**	NA
Cyanide	15.8	--	0.65 U	0.6 U	0.55 U	0.6 U	NA	**29.0**	0.6 U	0.55 U	0.6 U	0.55 U	NA
Iron	5 < pH > 8	19,900	**6,840**	**8,000**	**7,240**	**11,000**	NA	**14,200**	**5,950**	**12,500**	**7,460**	**4,160**	NA
Lead	120	17.4	**13.1**	**16.6**	**14.4**	**30.0**	NA	**83.7**	**26.6**	**7.4**	**8.0**	**10.9**	NA
Manganese	220	324	**57.8 L**	**153 L**	**138 L**	**120 L**	NA	**387 L**	**145 L**	**31.8 L**	**30.3 L**	**92.7 L**	NA
Mercury	0.10	0.111	0.13 U	0.13 U	0.12 U	0.12 UL	NA	**0.09 J**	0.12 U	0.12 U	**0.07 J**	0.12 UL	NA
Nickel	38.0	9.52	**5.4 J**	**5.6 J**	**4.8 J**	**5.9**	NA	**6.6 J**	**3.8 J**	**3.0 J**	**2.4 J**	**3.8**	NA
Selenium	0.52	0.51	3.3 UL	4.3 UL	3 UL	3.8 U	NA	3.4 UL	3.2 UL	**0.31 L**	2.2 UL	3.3 U	NA
Silver	560	2.10	0.95 U	1.2 U	0.87 U	1.1 U	NA	**0.24 J**	0.9 U	**0.08 J**	**0.07 J**	0.94 U	NA
Vanadium	130	27.9	**13.3**	**13.2**	**11.2**	**19.2**	NA	**17.6**	**12.0**	**40.8**	**23.1**	**11.1**	NA
Zinc	120	26.5	**34.5 L**	**30.2 L**	**24.8 L**	**35.8 K**	NA	**316 L**	**51.4 L**	**14.8 L**	**16.7 L**	**19.6 K**	NA
Other Parameters													
Total organic carbon (MG/KG)	--	--	**39,000**	**44,000**	NA	**54,000**	NA	**110,000**	**38,000**	**30,000**	NA	**9,200**	NA
pH	--	--	**8.2**	**6.3**	NA	**6.4**	NA	**7.9**	**7.1**	**6.4**	NA	**8.4**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-5
Exceedances - AOC 1 North Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA01-SO08	CAA01-SO09	CAA01-SO11	CAA01-SO16
Sample ID			CAA01-SS08-1108	CAA01-SS09-1108	CAA01-SS11-1108	CAA01-SS16-1108
Sample Date			11/07/08	11/07/08	11/07/08	11/07/08
Volatile Organic Compounds (UG/KG)						
Styrene	64,000	--	12 U	**3 J**	17 U	**3 J**
Semivolatile Organic Compounds (UG/KG)						
Benzaldehyde	--	--	380 U	400 U	560 UL	400 U
Benzo(a)anthracene	HMW PAH	--	380 U	400 U	**370 L**	400 U
Benzo(a)pyrene	HMW PAH	--	380 U	400 U	**750 L**	400 U
Benzo(b)fluoranthene	HMW PAH	--	380 U	400 U	**2,400 L**	400 U
Benzo(g,h,i)perylene	HMW PAH	--	380 U	400 U	**1,000 L**	400 U
Benzo(k)fluoranthene	HMW PAH	--	380 U	400 U	**820 L**	400 U
Chrysene	HMW PAH	--	380 U	400 U	**1,400 L**	400 U
Dibenz(a,h)anthracene	HMW PAH	--	380 U	400 U	**330 L**	400 U
Fluoranthene	LMW PAH	--	380 U	400 U	560 UL	400 U
Indeno(1,2,3-cd)pyrene	HMW PAH	--	380 U	400 U	**750 L**	400 U
PAH (HMW)	18,000	--	1,710 U	1,800 U	**8,110 L**	1,800 U
PAH (LMW)	29,000	--	1,710 U	1,800 U	2,520 U	1,800 U
Pyrene	HMW PAH	--	380 U	400 U	**290 L**	400 U
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDD	583	--	**1.7 J**	4.5 U	5.1 U	4.1 U
4,4'-DDE	114	--	**2.8 J**	4.5 U	**1.8 J**	4.1 U
4,4'-DDT	100	--	**3.8 J**	4.5 U	**4.7 J**	4.1 U
Endosulfan I	6.32	--	1.9 U	2.2 U	2.6 U	2 U
Endrin	1.95	--	3.9 U	4.5 U	**3.3 J**	4.1 U
Endrin aldehyde	1.95	--	3.9 U	4.5 U	**3.1 J**	4.1 U
gamma-Chlordane	11.0	--	1.9 U	2.2 U	2.6 U	**1.9 J**
Explosives (UG/KG)						
No Detections	--	--	NA	NA	NA	NA
Inorganics (MG/KG)						
Aluminum	pH < 5.5	12,200	**8,940**	**6,140**	**11,400**	**7,310**
Antimony	78.0	11.0	5.4 UL	5.9 UL	**1 L**	6.6 UL
Arsenic	18.0	6.36	**2.7**	**1.5**	**16.8**	**4.5**
Barium	330	52.9	**39.9**	**19.3 J**	**124**	**22.5**
Beryllium	40.0	0.587	**0.44 J**	**0.33 J**	**0.78**	**0.40 J**
Cadmium	32.0	1.50	0.04 B	0.49 U	**1.30**	**0.08 J**
Chromium	64.0	18.2	**11.9**	**5.3**	**48.7**	**13.6**
Cobalt	13.0	9.93	**2.2 J**	**1.8 J**	**3.9 J**	**2.7 J**
Copper	70.0	4.25	**6.7**	**2.3 J**	**17.5**	**3.2**
Cyanide	15.8	--	0.55 U	0.6 U	0.85 U	0.55 U
Iron	5 < pH > 8	19,900	**8,440**	**3,320**	**17,000**	**17,100**
Lead	120	17.4	**35.2**	**14.0**	**121**	**12.4**
Manganese	220	324	**119**	**29.7**	**426**	**51.7**
Mercury	0.10	0.111	0.04 B	0.05 B	**0.15**	0.05 B
Nickel	38.0	9.52	**3.9**	**2.8 J**	**8.9**	**4.6**
Selenium	0.52	0.51	3.2 U	3.4 U	4.9 U	3.8 U
Silver	560	2.10	**0.18 J**	**0.07 J**	**0.55 J**	1.1 U
Vanadium	130	27.9	**16.4**	**10.7**	**22.8**	**23.0**
Zinc	120	26.5	**36.3**	**11.3**	**872**	**26.6**
Other Parameters						
Total organic carbon (MG/KG)	--	--	**18,000**	**28,000**	**140,000**	**27,000**
pH	--	--	**7.3**	**5.3**	**7.5**	**7.3**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-6
Ecological Screening Statistics - AOC 1 South Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
2-Butanone	13.0 - 17.0	2 / 8	7.00	8.00	CAA01-SS15-1108	7.06	0.78	7.58	7.03	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Acetone	3.00 - 95.0	1 / 8	34.0	34.0	CAA01-SS18-1208	13.7	17.2	25.2	7.37	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Styrene	13.0 - 17.0	1 / 8	33.0	33.0	CAA01-SS10-1108	10.4	9.15	16.6	8.68	64,000	0 / 8	0.001	--	-- / --	--	NO	--	--	NO
Toluene	13.0 - 17.0	1 / 8	2.00	2.00	CAA01-SS13-1108	6.56	1.99	7.90	6.12	40,000	0 / 8	0.0001	--	-- / --	--	NO	--	--	NO
Semivolatile Organic Compounds (UG/KG)																			
Acenaphthylene	410 - 570	1 / 8	360	360	CAA01-SS15-1108	251	53.4	286	246	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Anthracene	410 - 570	1 / 8	800	800	CAA01-SS15-1108	306	202	441	272	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Benzo(a)anthracene	410 - 570	1 / 8	1,900	1,900	CAA01-SS15-1108	443	589	838	303	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(a)pyrene	410 - 570	1 / 8	1,500	1,500	CAA01-SS15-1108	393	448	693	294	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(b)fluoranthene	410 - 570	1 / 8	1,400	1,400	CAA01-SS15-1108	381	413	657	292	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(g,h,i)perylene	410 - 570	1 / 8	820	820	CAA01-SS15-1108	308	209	448	273	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(k)fluoranthene	410 - 570	1 / 8	1,100	1,100	CAA01-SS15-1108	343	307	549	283	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Carbazole	410 - 570	1 / 8	610	610	CAA01-SS15-1108	282	136	373	263	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Chrysene	410 - 570	1 / 8	1,800	1,800	CAA01-SS15-1108	431	554	802	301	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Dibenz(a,h)anthracene	410 - 570	1 / 8	270	270	CAA01-SS15-1108	239	32.5	261	237	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Fluoranthene	410 - 570	1 / 8	4,900	4,900	CAA01-SS15-1108	818	1,650	1,923	341	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Fluorene	410 - 570	1 / 8	660	660	CAA01-SS15-1108	288	153	391	266	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Indeno(1,2,3-cd)pyrene	410 - 570	1 / 8	780	780	CAA01-SS15-1108	303	195	434	271	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	1,845 - 2,565	1 / 8	13,970	13,970	CAA01-SS15-1108	2,672	4,567	5,731	1,450	18,000	0 / 8	0.78	--	-- / --	--	NO	--	--	NO
PAH (LMW)	1,845 - 2,565	1 / 8	12,960	12,960	CAA01-SS15-1108	2,545	4,210	5,366	1,437	29,000	0 / 8	0.45	--	-- / --	--	NO	--	--	NO
Phenanthrene	410 - 570	1 / 8	5,200	5,200	CAA01-SS15-1108	856	1,756	2,032	344	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Pyrene	410 - 570	1 / 8	4,400	4,400	CAA01-SS15-1108	756	1,473	1,742	337	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	410 - 550	2 / 8	450	790	CAA01-SS19-1208	331	201	466	295	30,000	0 / 8	0.03	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	4.00 - 5.40	4 / 8	0.23	1.00	CAA01-SS15-1108	1.43	0.91	2.04	1.10	583	0 / 8	0.002	--	-- / --	--	NO	--	--	NO
4,4'-DDE	4.00 - 5.40	3 / 8	0.34	0.56	CAA01-SS14-1108	1.59	0.98	2.25	1.22	114	0 / 8	0.005	--	-- / --	--	NO	--	--	NO
4,4'-DDT	4.00 - 5.40	3 / 8	0.53	1.40	CAA01-SS14-1108	1.82	0.72	2.30	1.64	100	0 / 8	0.01	--	-- / --	--	NO	--	--	NO
Dieldrin	4.00 - 5.70	1 / 8	0.46	0.46	CAA01-SS15-1108	2.09	0.72	2.57	1.88	10.5	0 / 8	0.04	--	-- / --	--	NO	--	--	NO
Endosulfan I	2.00 - 2.80	1 / 8	0.29	0.29	CAA01-SS13-1108	1.07	0.35	1.31	0.99	6.32	0 / 8	0.05	--	-- / --	--	NO	--	--	NO
Endrin aldehyde	4.00 - 5.70	1 / 8	1.90	1.90	CAA01-SS13-1108	2.31	0.34	2.53	2.29	1.95	0 / 8	0.97	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	8 / 8	6,200	13,900	CAA01-SS14-1108	9,100	2,883	11,031	8,713	pH < 5.5	0 / 8	--	--	-- / --	--	NO	--	--	NO
Antimony	3.80 - 6.40	4 / 8	0.12	6.30	CAA01-SS15-1108	2.57	1.79	3.77	1.79	78.0	0 / 8	0.08	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	8 / 8	1.90	21.8	CAA01-SS18-1208	6.89	6.40	11.2	5.14	18.0	1 / 8	1.21	6.36	3 / 8	3.43	**YES**	0.62	0.38	NO
Barium	-- - --	8 / 8	13.7	90.2	CAA01-SS15-1108	48.3	25.8	65.6	41.7	330	0 / 8	0.27	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	8 / 8	0.15	0.64	CAA01-SS14-1108	0.38	0.16	0.49	0.34	40.0	0 / 8	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.32 - 0.32	7 / 8	0.090	2.00	CAA01-SS14-1108	0.63	0.72	1.12	0.35	32.0	0 / 8	0.06	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	8 / 8	1,020	11,900	CAA01-SS15-1108	6,314	4,392	9,256	4,594	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	8 / 8	7.40	18.4	CAA01-SS14-1108	11.3	3.80	13.8	10.8	64.0	0 / 8	0.29	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	8 / 8	0.67	4.60	CAA01-SS15-1108	2.81	1.30	3.68	2.45	13.0	0 / 8	0.35	--	-- / --	--	NO	--	--	NO
Copper	-- - --	8 / 8	2.30	88.5	CAA01-SS15-1108	30.5	33.5	52.9	15.2	70.0	2 / 8	1.26	4.25	7 / 8	20.8	**YES**	0.76	0.44	NO
Cyanide	0.55 - 0.80	2 / 8	0.40	0.51	CAA01-SS15-1108	0.35	0.080	0.40	0.34	15.8	0 / 8	0.03	--	-- / --	--	NO	--	--	NO
Iron	-- - --	8 / 8	5,500	32,300	CAA01-SS15-1108	15,440	8,755	21,305	13,450	5 < pH > 8	0 / 8	--	--	-- / --	--	NO	--	--	NO
Lead	-- - --	8 / 8	8.30	698	CAA01-SS15-1108	162	247	327	49.7	120	3 / 8	5.82	17.4	5 / 8	40.1	**YES**	2.73	1.35	**YES**
Magnesium [2]	-- - --	8 / 8	289	1,230	CAA01-SS14-1108	642	335	866	572	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	8 / 8	17.4	394	CAA01-SS15-1108	255	132	344	193	220	5 / 8	1.79	324	3 / 8	1.22	**YES**	1.56	1.16	**YES**
Mercury	0.080 - 0.18	3 / 8	0.11	0.14	CAA01-SS15-1108	0.083	0.038	0.11	0.075	0.10	3 / 8	1.40	0.111	2 / 8	1.26	**YES**	1.08	0.83	NO
Nickel	-- - --	8 / 8	1.60	12.9	CAA01-SS15-1108	5.66	3.63	8.10	4.73	38.0	0 / 8	0.34	--	-- / --	--	NO	--	--	NO

TABLE B-6

Ecological Screening Statistics - AOC 1 South Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Potassium [2]	-- - --	8 / 8	268	1,150	CAA01-SS14-1108	474	283	664	427	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Silver	0.90 - 1.50	6 / 8	0.14	0.30	CAA01-SS13-1108	0.30	0.21	0.44	0.26	560	0 / 8	0.001	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	8 / 8	10.6	30.0	CAA01-SS10-1108	18.8	7.42	23.8	17.6	130	0 / 8	0.23	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	8 / 8	6.80	477	CAA01-SS15-1108	133	150	234	73.8	120	3 / 8	3.98	26.5	6 / 8	18.0	**YES**	1.95	1.11	**YES**
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	8 / 8	1,200	140,000	CAA01-SS15-1108	58,400	48,505	90,890	32,445	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	8 / 8	5.70	7.90	CAA01-SS14-1108	7.20	0.79	7.73	7.16	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-7
Exceedances - AOC 1 South Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	Eco Soil Screening Value	95% UTL	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID			CAA01-SS10-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108	CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date			11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Volatile Organic Compounds (UG/KG)											
2-Butanone	--	--	13 U	14 U	13 U	13 U	**8.0 J**	17 U	**7.0 J**	**3.0 J**	13 U
Acetone	--	--	3 B	9 B	14 B	10 B	95 B	7 B	**34**	15 B	13 U
Styrene	64,000	--	**33**	14 U	13 U	13 U	15 U	17 U	16 U	15 U	13 U
Toluene	40,000	--	13 U	14 U	**2 J**	13 U	15 U	17 U	16 U	15 U	13 U
Semivolatile Organic Compounds (UG/KG)											
Acenaphthylene	LMW PAH	--	410 U	460 U	420 U	460 U	**360 J**	570 U	520 U	550 U	420 U
Anthracene	LMW PAH	--	410 U	460 U	420 U	460 U	**800**	570 U	520 U	550 U	420 U
Benzo(a)anthracene	HMW PAH	--	410 U	460 U	420 U	460 U	**1,900**	570 U	520 U	550 U	420 U
Benzo(a)pyrene	HMW PAH	--	410 U	460 U	420 U	460 U	**1,500**	570 U	520 U	550 U	420 U
Benzo(b)fluoranthene	HMW PAH	--	410 U	460 U	420 U	460 U	**1,400**	570 U	520 U	550 U	420 U
Benzo(g,h,i)perylene	HMW PAH	--	410 U	460 U	420 U	460 U	**820**	570 U	520 U	550 U	420 U
Benzo(k)fluoranthene	HMW PAH	--	410 U	460 U	420 U	460 U	**1,100**	570 U	520 U	550 U	420 U
Carbazole	--	--	410 U	460 U	420 U	460 U	**610**	570 U	520 U	550 U	420 U
Chrysene	HMW PAH	--	410 U	460 U	420 U	460 U	**1,800**	570 U	520 U	550 U	420 U
Dibenz(a,h)anthracene	HMW PAH	--	410 U	460 U	420 U	460 U	**270 J**	570 U	520 U	550 U	420 U
Fluoranthene	LMW PAH	--	410 U	460 U	420 U	460 U	**4,900**	570 U	520 U	550 U	420 U
Fluorene	LMW PAH	--	410 U	460 U	420 U	460 U	**660**	570 U	520 U	550 U	420 U
Indeno(1,2,3-cd)pyrene	HMW PAH	--	410 U	460 U	420 U	460 U	**780**	570 U	520 U	550 U	420 U
PAH (HMW)	18,000	--	1,845 U	2,070 U	1,890 U	2,070 U	**13,970**	2,565 U	2,340 U	2,475 U	1,890 U
PAH (LMW)	29,000	--	1,845 U	2,070 U	1,890 U	2,070 U	**12,960**	2,565 U	2,340 U	2,475 U	1,890 U
Phenanthrene	LMW PAH	--	410 U	460 U	420 U	460 U	**5,200**	570 U	520 U	550 U	420 U
Pyrene	HMW PAH	--	410 U	460 U	420 U	460 U	**4,400**	570 U	520 U	550 U	420 U
bis(2-Ethylhexyl)phthalate	30,000	--	410 U	460 U	420 U	460 U	520 U	**450 J**	520 U	550 U	**790**
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	583	--	4 U	4.3 U	**0.67 J**	**0.58 J**	**1.0 J**	**0.23 J**	4.9 U	5.4 U	4.2 U
4,4'-DDE	114	--	4 U	4.3 U	**0.43 J**	**0.56 J**	4.9 U	**0.34 J**	4.9 U	5.4 U	4.2 U
4,4'-DDT	100	--	4 U	4.3 U	**0.53 J**	**1.4 J**	4.9 U	**1.2 J**	4.9 U	5.4 U	4.2 U
Dieldrin	10.5	--	4 U	4.3 U	4.3 U	4.6 U	**0.46 J**	5.7 U	4.9 U	5.4 U	4.2 U
Endosulfan I	6.32	--	2 U	2.2 U	**0.29 J**	2.3 U	2.5 U	2.8 U	2.5 U	2.7 U	2.1 U
Endrin aldehyde	1.95	--	4 U	4.3 U	**1.9 J**	4.6 U	4.9 U	5.7 U	4.9 U	5.4 U	4.2 U
Explosives (UG/KG)											
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)											
Aluminum	pH < 5.5	12,200	**11,300**	**8,180**	**11,400**	**13,900**	**6,200**	**9,230**	**5,780**	**6,250**	**6,340**
Antimony	78.0	11.0	3.8 UL	4.5 UL	6.4 UL	**2.0 L**	**6.3 L**	**1.6 L**	**0.10 L**	**0.12 L**	6.4 UL
Arsenic	18.0	6.36	**1.9**	**1.9**	**3.8**	**5.6**	**7.8**	**5.4**	**12.0**	**21.8**	**6.9**
Barium	330	52.9	**13.7**	**33.7**	**56.6**	**53.4**	**90.2**	**76.6**	**23.8 J**	**32.3**	**29.6**
Beryllium	40.0	0.587	**0.15 J**	**0.34 J**	**0.54**	**0.64**	**0.42 J**	**0.42 J**	**0.23 J**	**0.26 J**	**0.24 J**
Cadmium	32.0	1.50	0.32 U	**0.11 J**	**0.09 J**	**2.0**	**1.5**	**0.62 J**	**0.21 J**	**0.38 J**	**0.21 J**
Chromium	64.0	18.2	**11.9**	**8.1**	**13.8**	**18.4**	**13.4**	**8.2**	**8.5**	**9.1**	**7.4**
Cobalt	13.0	9.93	**0.67 J**	**1.6 J**	**2.8 J**	**3.9 J**	**4.6 J**	**3.8 J**	**2.6 J**	**2.9 J**	**2.2 J**
Copper	70.0	4.25	**2.3**	**5.8**	**18.3**	**70**	**88.5**	**45.8**	**4.4**	**5.5**	**7.4**
Cyanide	15.8	--	0.55 U	0.6 U	0.6 U	0.65 U	**0.51 J**	**0.4 L**	0.75 UL	0.8 UL	0.6 UL
Iron	5 < pH > 8	19,900	**9,570**	**5,500**	**10,600**	**22,400**	**32,300**	**14,700**	**12,900**	**18,900**	**9,550**
Lead	120	17.4	**8.3**	**21.3**	**39.4**	**351**	**698**	**151**	**11.2**	**14.1**	**10.3**
Manganese	220	324	**17.4**	**179**	**384**	**281**	**394**	**285**	**98.1**	**145**	**358**
Mercury	0.10	0.111	0.11 U	0.09 B	**0.12**	0.08 B	**0.14 J**	**0.11 L**	0.15 UL	0.18 UL	0.12 UL
Nickel	38.0	9.52	**1.6 J**	**3.3**	**5.9**	**8.5**	**12.9**	**6.1 J**	**3.5 J**	**3.9 J**	**3.1 J**
Silver	560	2.10	**0.2 J**	**0.14 J**	**0.3 J**	0.9 U	**0.26 J**	**0.15 J**	1.3 U	1.5 U	**0.18 J**
Vanadium	130	27.9	**30.0**	**14.0**	**20.2**	**30.0**	**15.9**	**13.8**	**14.4**	**15.8**	**10.6**

TABLE B-7

Exceedances - AOC 1 South Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID			CAA01-SS10-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108	CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date			11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Zinc	120	26.5	**6.8**	**26.3**	**55.2**	**162**	**477**	**115**	**100**	**157**	**63.7**
Other Parameters											
Total organic carbon (MG/KG)	--	--	**1,200**	**31,000**	**29,000**	**64,000**	**140,000**	**110,000**	**38,000**	**77,000**	**15,000**
pH	--	--	**5.7**	**6.7**	**7.8**	**7.9**	**6.6**	**7.5**	**7.5**	**7.6**	**7.8**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-8

Ecological Screening Statistics - AOC 1 North Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
2-Butanone	10.0 - 13.0	1 / 10	2.00	2.00	CAA01-SB01-1108	5.35	1.25	6.07	5.14	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Styrene	11.0 - 14.0	2 / 10	1.00	2.00	CAA01-SB02-1108	5.10	1.97	6.24	4.48	64,000	0 / 10	0.00003	--	-- / --	--	NO	--	--	NO
Toluene	10.0 - 14.0	1 / 10	2.00	2.00	CAA01-SB02-1108	5.50	1.35	6.28	5.26	40,000	0 / 10	0.0001	--	-- / --	--	NO	--	--	NO
Semivolatile Organic Compounds (UG/KG)																			
PAH (HMW)	1,575 - 2,025	1 / 10	1,680	1,680	CAA01-SB05-1108	947	268	1,102	922	18,000	0 / 10	0.09	--	-- / --	--	NO	--	--	NO
Pyrene	350 - 450	1 / 10	120	120	CAA01-SB05-1108	185	27.9	201	183	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	3.50 - 4.20	2 / 10	0.87	5.20	CAA01-SB08-1108	2.13	1.13	2.79	1.95	583	0 / 10	0.01	--	-- / --	--	NO	--	--	NO
4,4'-DDE	3.50 - 4.00	4 / 10	0.23	26.0	CAA01-SB08-1108	3.95	7.78	8.45	1.61	114	0 / 10	0.23	--	-- / --	--	NO	--	--	NO
4,4'-DDT	3.50 - 4.20	2 / 10	3.40	15.0	CAA01-SB08-1108	3.37	4.12	5.75	2.48	100	0 / 10	0.15	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	10 / 10	5,370	19,200	CAA01-SB06-1108	9,266	4,093	11,639	8,616	pH < 5.5	1 / 10	--	13,000	1 / 10	1.48	**YES**	mean pH > 5.5		NO
Antimony	3.70 - 6.10	2 / 10	0.090	0.14	CAA01-SB16-1108	1.91	1.03	2.51	1.26	78.0	0 / 10	0.002	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	10 / 10	1.10	6.80	CAA01-SB02-1108	3.46	2.19	4.73	2.87	18.0	0 / 10	0.38	--	-- / --	--	NO	--	--	NO
Barium	-- - --	10 / 10	15.4	42.2	CAA01-SB03-1108	25.3	7.58	29.7	24.3	330	0 / 10	0.13	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	10 / 10	0.17	0.98	CAA01-SB02-1108	0.46	0.23	0.59	0.41	40.0	0 / 10	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.020 - 0.69	2 / 10	0.030	0.040	CAA01-SB01-1108	0.14	0.12	0.21	0.081	32.0	0 / 10	0.001	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	10 / 10	93.4	16,400	CAA01-SB01-1108	2,668	4,904	5,510	1,038	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	10 / 10	4.80	21.8	CAA01-SB16-1108	11.7	5.79	15.1	10.4	64.0	0 / 10	0.34	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	10 / 10	0.76	8.40	CAA01-SB02-1108	3.96	2.46	5.38	3.22	13.0	0 / 10	0.65	--	-- / --	--	NO	--	--	NO
Copper	-- - --	10 / 10	1.30	11.0	CAA01-SB03-1108	3.56	2.82	5.19	2.93	70.0	0 / 10	0.16	--	-- / --	--	NO	--	--	NO
Cyanide	0.50 - 0.60	1 / 10	10.0	10.0	CAA01-SB05-1108	1.25	3.08	3.03	0.39	15.8	0 / 10	0.63	--	-- / --	--	NO	--	--	NO
Iron	-- - --	10 / 10	2,470	28,900	CAA01-SB16-1108	11,226	8,243	16,004	8,691	5 < pH > 8	1 / 10	--	32,000	0 / 10	0.90	NO	--	--	NO
Lead	-- - --	10 / 10	6.10	41.2	CAA01-SB03-1108	13.6	10.8	19.9	11.3	120	0 / 10	0.34	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	10 / 10	246	1,200	CAA01-SB08-1108	602	350	805	516	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	10 / 10	14.2	106	CAA01-SB08-1108	57.2	31.5	75.5	48.4	220	0 / 10	0.48	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	10 / 10	2.30	9.70	CAA01-SB02-1108	4.80	2.35	6.16	4.33	38.0	0 / 10	0.26	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	10 / 10	176	918	CAA01-SB16-1108	481	245	623	424	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.20 - 4.80	1 / 10	0.44	0.44	CAA01-SB03-1108	1.35	0.52	1.65	1.25	0.52	0 / 10	0.85	--	-- / --	--	NO	--	--	NO
Silver	0.65 - 1.40	4 / 10	0.090	0.25	CAA01-SB08-1108	0.31	0.19	0.42	0.26	560	0 / 10	0.0004	--	-- / --	--	NO	--	--	NO
Sodium [2]	12.4 - 28.5	5 / 10	16.2	28.3	CAA01-SB01-1108	16.6	7.14	20.7	15.1	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	10 / 10	7.80	36.1	CAA01-SB06-1108	18.8	10.4	24.8	16.3	130	0 / 10	0.28	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	10 / 10	6.50	35.0	CAA01-SB03-1108	19.3	10.1	25.1	16.8	120	0 / 10	0.29	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	10 / 10	3,200	58,000	CAA01-SB03-1108	14,380	15,930	23,615	10,283	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	10 / 10	5.40	9.90	CAA01-SB01-1108	6.74	1.30	7.49	6.64	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-9
Exceedances - AOC 1 North Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07	
Sample ID			CAA01-SB01-1108	CAA01-SB02-1108	CAA01-SB02P-1108	CAA01-SB03-1108	CAA01-SB03-1208	CAA01-SB04-1108	CAA01-SB05-1108	CAA01-SB06-1108	CAA01-SB06P-1108	CAA01-SB07-1108	CAA01-SB07-1208
Sample Date			11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08
Volatile Organic Compounds (UG/KG)													
2-Butanone	--	--	**2 J**	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA
Styrene	64,000	--	14 U	**2 J**	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA
Toluene	40,000	--	14 U	**2 J**	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA
Semivolatile Organic Compounds (UG/KG)													
PAH (HMW)	18,000	--	2,025 U	1,665 U	1,665 U	1,620 U	NA	1,620 U	**1,680 J**	1,755 U	1,755 U	1,935 U	NA
Pyrene	HMW PAH	--	450 U	370 U	370 U	360 U	NA	360 U	**120 J**	390 U	390 U	430 U	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	583	--	4.2 U	3.7 U	3.7 U	NA	**0.87 J**	3.6 U	3.6 U	3.9 U	4 U	NA	4 U
4,4'-DDE	114	--	**0.23 J**	3.7 U	3.7 U	NA	**1.6 J**	**0.27 J**	3.6 U	3.9 U	4 U	NA	4 U
4,4'-DDT	100	--	4.2 U	3.7 U	3.7 U	NA	**3.4 J**	3.6 U	3.6 U	3.9 U	4 U	NA	4 U
Explosives (UG/KG)													
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)													
Aluminum	pH < 5.5	13,000	**7,560**	**8,540**	**7,980**	**10,400**	NA	**5,680**	**6,130**	**19,200**	**18,600**	**7,680**	NA
Antimony	78.0	--	**0.09 L**	5.1 UL	4.9 UL	5.5 UL	NA	4 UL	6.1 UL	3.8 UL	5.5 UL	3.9 UL	NA
Arsenic	18.0	5.54	**1.6 L**	**6.0 L**	**6.8 L**	**5.3 L**	NA	**2.0 L**	**2.0 L**	**1.7 L**	**2.2 L**	**2.1 L**	NA
Barium	330	84.5	**27.0**	**28.1**	**28.8**	**42.2 K**	NA	**25.3**	**26.0**	**15.3**	**20.2**	**26.2 K**	NA
Beryllium	40.0	0.52	**0.33 J**	**0.89**	**0.98**	**0.50**	NA	**0.35**	**0.37 J**	**0.13 J**	**0.17 J**	**0.58**	NA
Cadmium	32.0	--	**0.04 J**	0.43 U	0.41 U	0.46 U	NA	**0.03 J**	0.02 B	0.32 U	0.46 U	0.02 B	NA
Chromium	64.0	33.7	**8.5**	**13.2**	**12.5**	**15.5**	NA	**6.9**	**7.4**	**18.0**	**18.6**	**6.2**	NA
Cobalt	13.0	5.18	**2.1 J**	**8.4 J**	**8.1 J**	**3.0 J**	NA	**2.8 J**	**3.4 J**	**0.52 J**	**0.76 J**	**6.7**	NA
Copper	70.0	3.17	**3.6**	**3.1**	**2.9**	**11**	NA	**2.2**	**2.6 J**	**1.5 J**	1.8 B	**2.0**	NA
Cyanide	15.8	2.70	0.55 U	0.5 U	0.5 U	0.5 U	NA	0.55 U	**10.0**	0.6 U	0.6 U	0.6 U	NA
Iron	5 < pH > 8	32,000	**4,740**	**16,200**	**17,600**	**16,900**	NA	**6,800**	**5,770**	**10,500**	**11,500**	**3,980**	NA
Lead	120	8.79	**7.5**	**9.7**	**10.4**	**41.2**	NA	**14.2**	**9.6**	**5.3**	**6.1**	**8.0**	NA
Manganese	220	176	**36.1 L**	**82.6 L**	**88.9 L**	**98.4 L**	NA	**42.9 L**	**49.8 L**	**10.3 L**	**14.2 L**	**57.9 L**	NA
Nickel	38.0	17.6	**3.6 J**	**9.7 J**	**8.6 J**	**6.6**	NA	**3.1 J**	**3.1 J**	**2.6 J**	**2.6 J**	**4.7**	NA
Selenium	0.52	0.64	2.5 UL	3 UL	2.8 UL	**0.44 J**	NA	2.3 UL	3.6 UL	2.2 UL	3.2 UL	2.3 U	NA
Silver	560	1.10	0.73 U	0.86 U	**0.09 J**	**0.11 J**	NA	0.66 U	1.0 U	**0.07 J**	**0.11 J**	0.66 U	NA
Vanadium	130	48.3	**10.8**	**19.4**	**23.3**	**22.1**	NA	**11.1**	**11.4**	**27.8**	**36.1**	**9.0**	NA
Zinc	120	28.0	**17.5 L**	**26.9 L**	**27.0 L**	**35.0 K**	NA	**20.3 L**	**12.1 L**	**5.2 L**	**8.5 L**	**10.8 K**	NA
Other Parameters													
Total organic carbon (MG/KG)	--	--	**18,000**	**14,000**	NA	**58,000**	NA	**4,700**	**10,000**	**3,200**	NA	**7,200**	NA
pH	--	--	**9.9**	**5.4**	NA	**7.1**	NA	**6.3**	**6.6**	**6.2**	NA	**6.8**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-9
Exceedances - AOC 1 North Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA01-SO08	CAA01-SO09	CAA01-SO16
Sample ID			CAA01-SB08-1108	CAA01-SB09-1108	CAA01-SB16-1108
Sample Date			11/07/08	11/07/08	11/07/08
Volatile Organic Compounds (UG/KG)					
2-Butanone	--	--	11 U	10 U	12 U
Styrene	64,000	--	11 U	**1 J**	12 U
Toluene	40,000	--	11 U	10 U	12 U
Semivolatile Organic Compounds (UG/KG)					
PAH (HMW)	18,000	--	1,665 U	1,575 U	1,710 U
Pyrene	HMW PAH	--	370 U	350 U	380 U
Pesticide/Polychlorinated Biphenyls (UG/KG)					
4,4'-DDD	583	--	**5.2**	3.5 U	3.9 U
4,4'-DDE	114	--	**26**	3.5 U	3.9 U
4,4'-DDT	100	--	**15**	3.5 U	3.9 U
Explosives (UG/KG)					
No Detections	--	--	NA	NA	NA
Inorganics (MG/KG)					
Aluminum	pH < 5.5	13,000	**10,500**	**5,370**	**11,600**
Antimony	78.0	--	3.7 UL	3.9 UL	**0.14 L**
Arsenic	18.0	5.54	**4.9**	**1.1**	**6.6**
Barium	330	84.5	**26.3**	**15.8**	**15.4**
Beryllium	40.0	0.52	**0.51**	**0.24 J**	**0.53**
Cadmium	32.0	--	0.31 U	0.32 U	0.69 U
Chromium	64.0	33.7	**14.2**	**4.8**	**21.8**
Cobalt	13.0	5.18	**6.4**	**1.7 J**	**4.3 J**
Copper	70.0	3.17	**4.7**	**1.3 J**	**3.6**
Cyanide	15.8	2.70	0.55 U	0.5 U	0.55 U
Iron	5 < pH > 8	32,000	**13,600**	**2,470**	**28,900**
Lead	120	8.79	**22.2**	**6.9**	**10.2**
Manganese	220	176	**106**	**21.0**	**56.6**
Nickel	38.0	17.6	**5.6**	**2.3 J**	**6.7**
Selenium	0.52	0.64	2.2 U	2.3 U	4.8 U
Silver	560	1.10	**0.25 J**	0.65 U	1.4 U
Vanadium	130	48.3	**22.0**	**7.8**	**34.3**
Zinc	120	28.0	**33.2**	**6.5**	**21.8**
Other Parameters					
Total organic carbon (MG/KG)	--	--	**12,000**	**8,700**	**8,000**
pH	--	--	**7.6**	**6**	**5.5**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-10

Ecological Screening Statistics - AOC 1 South Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
2-Butanone	10.0 - 14.0	1 / 8	9.00	9.00	CAA01-SB18-1208	6.50	1.16	7.28	6.42	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Acetone	2.00 - 18.0	1 / 8	48.0	48.0	CAA01-SB18-1208	11.0	15.1	21.1	6.50	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Carbon disulfide	10.0 - 14.0	1 / 8	2.00	2.00	CAA01-SB18-1208	5.63	1.58	6.68	5.32	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Semivolatile Organic Compounds (UG/KG)																			
Benzo(a)pyrene	350 - 470	1 / 8	220	220	CAA01-SB17-1208	211	18.5	224	211	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(b)fluoranthene	350 - 470	1 / 8	290	290	CAA01-SB17-1208	220	33.6	243	218	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(g,h,i)perylene	350 - 470	1 / 8	350	350	CAA01-SB17-1208	228	52.7	263	223	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Indeno(1,2,3-cd)pyrene	350 - 470	1 / 8	270	270	CAA01-SB17-1208	218	27.9	236	216	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	1,575 - 2,115	1 / 8	2,230	2,230	CAA01-SB17-1208	1,106	462	1,415	1,048	18,000	0 / 8	0.12	--	-- / --	--	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	350 - 470	1 / 8	210	210	CAA01-SB15-1108	212	18.3	224	211	30,000	0 / 8	0.01	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	3.50 - 4.50	2 / 8	0.27	0.48	CAA01-SB17-1208	1.63	0.79	2.16	1.32	583	0 / 8	0.001	--	-- / --	--	NO	--	--	NO
4,4'-DDE	3.50 - 4.50	3 / 8	0.22	0.28	CAA01-SB15-1108	1.37	0.93	1.99	0.93	114	0 / 8	0.002	--	-- / --	--	NO	--	--	NO
4,4'-DDT	3.50 - 4.50	2 / 8	0.45	0.48	CAA01-SB13-1108	1.65	0.75	2.16	1.41	100	0 / 8	0.005	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	8 / 8	4,220	15,100	CAA01-SB10-1108	9,080	3,161	11,197	8,583	pH < 5.5	0 / 8	--	--	-- / --	--	NO	--	--	NO
Antimony	4.00 - 7.10	6 / 8	0.32	46.1	CAA01-SB15-1108	6.86	15.9	17.5	1.34	78.0	0 / 8	0.59	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	8 / 8	1.50	17.4	CAA01-SB15-1108	7.19	5.63	11.0	5.46	18.0	0 / 8	0.97	--	-- / --	--	NO	--	--	NO
Barium	-- - --	8 / 8	20.5	61.6	CAA01-SB17-1208	36.9	14.8	46.8	34.3	330	0 / 8	0.19	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	8 / 8	0.22	0.59	CAA01-SB13-1108	0.43	0.13	0.52	0.41	40.0	0 / 8	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.030 - 0.72	5 / 8	0.15	4.00	CAA01-SB15-1108	0.69	1.35	1.59	0.19	32.0	0 / 8	0.13	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	8 / 8	364	27,100	CAA01-SB15-1108	10,882	11,779	18,772	4,736	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	8 / 8	4.00	27.6	CAA01-SB15-1108	13.9	7.79	19.1	12.0	64.0	0 / 8	0.43	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	8 / 8	1.30	7.30	CAA01-SB15-1108	3.60	1.78	4.79	3.24	13.0	0 / 8	0.56	--	-- / --	--	NO	--	--	NO
Copper	-- - --	8 / 8	1.40	105	CAA01-SB15-1108	28.0	36.5	52.4	13.3	70.0	1 / 8	1.50	3.17	7 / 8	33.1	**YES**	0.75	0.40	NO
Cyanide	0.50 - 0.70	1 / 8	0.30	0.30	CAA01-SB15-1108	0.31	0.033	0.33	0.31	15.8	0 / 8	0.02	--	-- / --	--	NO	--	--	NO
Iron	-- - --	8 / 8	2,250	43,300	CAA01-SB15-1108	16,749	13,404	25,727	12,101	5 < pH > 8	1 / 8	--	32,000	1 / 8	1.35	**YES**	mean pH in range		NO
Lead	-- - --	8 / 8	5.70	3,360	CAA01-SB15-1108	478	1,168	1,261	52.8	120	2 / 8	28.0	8.79	7 / 8	382	**YES**	10.5	3.99	**YES**
Magnesium [2]	-- - --	8 / 8	170	1,460	CAA01-SB14-1108	839	475	1,157	696	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	8 / 8	46.1	300	CAA01-SB15-1108	163	97.3	228	136	220	3 / 8	1.36	176	3 / 8	1.70	**YES**	1.04	0.74	NO
Nickel	-- - --	8 / 8	1.90	23.0	CAA01-SB15-1108	7.53	6.62	12.0	5.86	38.0	0 / 8	0.61	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	8 / 8	126	836	CAA01-SB10-1108	470	246	635	409	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Silver	0.68 - 2.10	2 / 8	0.11	0.26	CAA01-SB19-1208	0.51	0.29	0.70	0.42	560	0 / 8	0.0005	--	-- / --	--	NO	--	--	NO
Sodium [2]	10.2 - 59.2	3 / 8	31.5	42.5	CAA01-SB19-1208	24.9	13.8	34.2	20.6	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	8 / 8	6.20	35.4	CAA01-SB10-1108	17.0	8.64	22.8	15.3	130	0 / 8	0.27	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	8 / 8	5.20	1,130	CAA01-SB15-1108	221	384	479	64.4	120	3 / 8	9.42	28.0	5 / 8	40.4	**YES**	3.99	1.85	**YES**
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	8 / 8	3,300	43,000	CAA01-SB17-1208	16,588	14,230	26,120	11,691	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	8 / 8	6.70	8.20	CAA01-SB17-1208	7.50	0.49	7.83	7.49	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-11
Exceedances - AOC 1 South Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	Eco Soil Screening Value	95% UTL	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID			CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date			11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Volatile Organic Compounds (UG/KG)											
2-Butanone	--	--	12 U	10 U	13 U	12 U	12 U	13 U	**8.0 J**	**9.0 J**	14 U
Acetone	--	--	2 B	18 B	12 B	12 U	9 B	13 U	**48**	**41**	14 U
Carbon disulfide	--	--	12 U	10 U	13 U	12 U	12 U	13 U	**2.0 J**	**1.0 J**	14 U
Semivolatile Organic Compounds (UG/KG)											
Benzo(a)pyrene	HMW PAH	--	420 U	350 U	440 U	400 U	410 UJ	**220 J**	450 U	450 U	470 U
Benzo(b)fluoranthene	HMW PAH	--	420 U	350 U	440 U	400 U	410 UJ	**290 J**	450 U	450 U	470 U
Benzo(g,h,i)perylene	HMW PAH	--	420 U	350 U	440 U	400 U	410 UJ	**350 J**	450 U	450 U	470 U
Indeno(1,2,3-cd)pyrene	HMW PAH	--	420 U	350 U	440 U	400 U	410 UJ	**270 J**	450 U	450 U	470 U
PAH (HMW)	18,000	--	1,890 U	1,575 U	1,980 U	1,800 U	1,845 U	**2,230 J**	2,025 U	2,025 U	2,115 U
bis(2-Ethylhexyl)phthalate	30,000	--	420 U	350 U	440 U	400 U	**210 J**	440 U	450 U	450 U	470 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	583	--	3.8 U	3.5 U	**0.27 J**	4.3 U	4.3 U	**0.48 J**	4.3 U	4.5 U	4.2 U
4,4'-DDE	114	--	3.8 U	3.5 U	**0.22 J**	4.3 U	**0.28 J**	**0.28 J**	4.3 U	4.5 U	4.2 U
4,4'-DDT	100	--	3.8 U	3.5 U	**0.48 J**	4.3 U	4.3 U	**0.45 J**	4.3 U	4.5 U	4.2 U
Explosives (UG/KG)											
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)											
Aluminum	pH < 5.5	13,000	**15,100**	**4,220**	**9,950**	**10,900**	**8,880**	**6,890**	**8,150**	**8,580**	**8,120**
Antimony	78.0	--	**0.32 L**	4.0 UL	7.1 UL	**0.49 L**	**46.1 L**	**1.7 L**	**0.21 L**	**0.32 L**	**0.37 L**
Arsenic	18.0	5.54	**5.8**	**1.5**	**2.6**	**3.9**	**17.4**	**5.2**	**14.1**	**6.7**	**7.0**
Barium	330	84.5	**25.7**	**20.5**	**40.2**	**41.0**	**52.6**	**61.6**	**19.1 J**	**21.4 J**	**32.0**
Beryllium	40.0	0.52	**0.49**	**0.29 J**	**0.59 J**	**0.58**	**0.49 J**	**0.41 J**	**0.20 J**	**0.22 J**	**0.34 J**
Cadmium	32.0	--	0.72 U	0.03 B	0.04 B	**0.15 J**	**4.0**	**0.45 J**	**0.34 J**	**0.30 J**	**0.20 J**
Chromium	64.0	33.7	**22.8**	**4.0**	**8.2**	**14.5**	**27.6**	**13.5**	**10.4**	**11.5**	**9.3**
Cobalt	13.0	5.18	**3.7 J**	**1.3 J**	**2.5 J**	**3.2 J**	**7.3 J**	**3.2 J**	**4.7 J**	**3.0 J**	**2.9 J**
Copper	70.0	3.17	**7.7**	**1.4 J**	**9.1**	**12.6**	**105**	**61.5**	**3.9**	**6.0**	**20.8**
Cyanide	15.8	2.70	0.6 U	0.5 U	0.6 U	0.6 U	**0.3 J**	0.65 UL	0.7 UL	0.6 UL	0.7 UL
Iron	5 < pH > 8	32,000	**28,500**	**2,250**	**5,140**	**16,300**	**43,300**	**16,700**	**9,790**	**10,200**	**11,600**
Lead	120	8.79	**93.7**	**5.7**	**14.4**	**38.6**	**3,360**	**283**	**9.6**	**11.0**	**19.5**
Manganese	220	176	**46.1**	**68.4**	**231**	**139**	**300**	**146**	**57.7**	**91.9**	**283**
Nickel	38.0	17.6	**8.2**	**1.9 J**	**4.3 J**	**5.8**	**23.0**	**8.4**	**4.4 J**	**4.1 J**	**4.2 J**
Silver	560	1.10	1.4 U	0.68 U	**0.11 J**	0.9 U	2.1 U	1.0 U	1.2 U	1.3 U	**0.26 J**
Vanadium	130	48.3	**35.4**	**6.2**	**12.2**	**20.6**	**16.9**	**12.8**	**17.6**	**18.5**	**13.6**
Zinc	120	28.0	**21.6**	**5.2**	**19.5**	**30.4**	**1,130**	**120**	**352**	**165**	**92.8**
Other Parameters											
Total organic carbon (MG/KG)	--	--	**4,600**	**5,800**	**10,000**	**3,300**	**32,000**	**43,000**	**16,000**	**7,600**	**18,000**
pH	--	--	**6.9**	**7.6**	**7.4**	**6.7**	**7.8**	**8.2**	**7.6**	**7.3**	**7.8**

Notes:
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
NA - Not analyzed
Equals or exceeds Background UTL

TABLE B-12

Ecological Screening Statistics - AOC 1 North Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Volatile Organic Compounds (UG/L)																				
Acetone	3.00 - 10.0	1 / 3	3.00	3.00	CAA01-DW03-1108	3.17	1.76	6.13	2.82	1,500	0 / 3	0.002	--	-- / --	--	NO	--	--	NO	NO
Inorganics (UG/L)																				
Aluminum	-- - --	3 / 3	3,420	142,000	CAA01-DW03-1108	52,207	77,861	183,468	17,586	87.0	3 / 3	1,632	2,230	3 / 3	63.7	**(NO)**	2,109	600	**(NO)**	**(NO)**
Antimony	-- - --	3 / 3	2.90	13.3	CAA01-DW03-1108	6.47	5.92	16.4	4.98	30.0	0 / 3	0.44	--	-- / --	--	NO	--	--	NO	NO
Arsenic	61.7 - 61.7	2 / 3	18.4	731	CAA01-DW03-1108	260	408	948	74.6	150	1 / 3	4.87	2.28	2 / 3	321	**(NO)**	6.32	1.73	**(NO)**	NO
Barium	-- - --	3 / 3	73.1	931	CAA01-DW03-1108	365	490	1,191	184	4.00	3 / 3	233	118	1 / 3	7.89	**(NO)**	298	91.3	**(NO)**	**(NO)**
Beryllium	-- - --	3 / 3	0.23	11.7	CAA01-DW03-1108	4.24	6.46	15.1	1.29	0.66	2 / 3	17.7	2.45	1 / 3	4.78	**(NO)**	22.9	6.43	**(NO)**	NO
Cadmium	0.21 - 0.38	1 / 3	1.70	1.70	CAA01-DW03-1108	0.67	0.90	2.18	0.32	0.27	1 / 3	6.28	0.61	1 / 3	2.81	**(NO)**	8.05	2.46	**(NO)**	NO
Calcium [2]	-- - --	3 / 3	193,000	1,650,000	CAA01-DW03-1108	679,333	840,623	2,096,501	395,997	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	21.8 - 21.8	2 / 3	61.5	1,050	CAA01-DW03-1108	374	586	1,362	89.0	11.4	2 / 3	92.1	15.1	2 / 3	69.5	**(NO)**	119	32.8	**(NO)**	**(NO)**
Cobalt	-- - --	3 / 3	2.80	90.5	CAA01-DW03-1108	33.5	49.4	117	12.3	23.0	1 / 3	3.93	20.6	1 / 3	4.39	**(NO)**	5.08	1.46	**(NO)**	NO
Copper	11.1 - 11.1	2 / 3	14.8	170	CAA01-DW03-1108	63.5	92.4	219	24.1	9.33	2 / 3	18.2	12.2	2 / 3	13.9	**(NO)**	23.5	6.80	**(NO)**	NO
Iron	-- - --	3 / 3	8,440	449,000	CAA01-DW03-1108	162,213	248,581	581,285	48,009	1,000	3 / 3	449	3,590	3 / 3	125	**(NO)**	581	162	**(NO)**	**(NO)**
Lead	3.70 - 3.70	2 / 3	11.2	130	CAA01-DW03-1108	47.7	71.4	168	13.9	3.18	2 / 3	40.9	21.3	1 / 3	6.10	**(NO)**	52.8	15.0	**(NO)**	**(NO)**
Magnesium [2]	-- - --	3 / 3	4,900	50,500	CAA01-DW03-1108	20,927	25,641	64,154	12,223	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	3 / 3	143	2,600	CAA01-DW03-1108	968	1,413	3,351	392	120	3 / 3	21.7	57.9	3 / 3	44.9	**(NO)**	27.9	8.07	**(NO)**	NO
Nickel	14.0 - 20.2	1 / 3	323	323	CAA01-DW03-1108	113	182	419	28.4	52.2	1 / 3	6.19	11.4	1 / 3	28.3	**(NO)**	8.04	2.17	**(NO)**	NO
Potassium [2]	-- - --	3 / 3	3,870	39,200	CAA01-DW03-1108	16,167	19,963	49,821	9,374	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Selenium	6.90 - 35.0	1 / 3	64.4	64.4	CAA01-DW03-1108	28.5	31.9	82.3	15.7	5.00	1 / 3	12.9	--	-- / --	--	**(NO)**	16.5	5.69	**(NO)**	NO
Silver	10.0 - 20.0	1 / 3	0.44	0.44	CAA01-DW01-1108	5.15	4.78	13.2	2.80	0.36	1 / 3	1.22	--	-- / --	--	**(NO)**	36.7	14.3	**(NO)**	**(NO)**
Sodium [2]	-- - --	3 / 3	6,890	23,000	CAA01-DW03-1108	12,630	8,998	27,799	10,823	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	3 / 3	18.2	821	CAA01-DW03-1108	300	452	1,062	96.6	20.0	2 / 3	41.1	26.2	2 / 3	31.3	**(NO)**	53.1	15.0	**(NO)**	**(NO)**
Zinc	22.7 - 22.7	2 / 3	62.6	758	CAA01-DW03-1108	277	417	980	81.4	120	1 / 3	6.33	4.52	2 / 3	168	**(NO)**	8.18	2.31	**(NO)**	NO
Dissolved Metals (UG/L)																				
Aluminum	-- - --	3 / 3	187	723	CAA01-DW01-1108	431	271	888	373	87.0	3 / 3	8.31	100	3 / 3	7.23	**YES**	10.2	4.96	**YES**	NO
Antimony	60.0 - 60.0	2 / 3	1.10	1.10	CAA01-DW01-1108	10.7	16.7	38.9	3.31	30.0	0 / 3	0.04	--	-- / --	--	NO	--	--	NO	NO
Arsenic	3.30 - 6.50	1 / 3	4.30	4.30	CAA01-DW03-1108	3.07	1.33	5.32	2.85	150	0 / 3	0.03	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	3 / 3	43.4	61.9	CAA01-DW02-1108	53.2	9.31	68.9	52.7	4.00	3 / 3	15.5	127	0 / 3	0.49	NO	--	--	NO	NO
Calcium [2]	-- - --	3 / 3	144,000	183,000	CAA01-DW02-1108	164,667	19,604	197,717	163,874	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	3 / 3	0.82	3.70	CAA01-DW01-1108	2.31	1.44	4.74	1.94	11.0	0 / 3	0.34	--	-- / --	--	NO	--	--	NO	NO
Cobalt	-- - --	3 / 3	1.40	3.00	CAA01-DW03-1108	1.97	0.90	3.48	1.85	23.0	0 / 3	0.13	--	-- / --	--	NO	--	--	NO	NO
Iron	-- - --	3 / 3	261	4,150	CAA01-DW03-1108	2,057	1,961	5,364	1,240	1,000	2 / 3	4.15	631	2 / 3	6.58	**YES**	5.36	2.06	**YES**	NO
Lead	1.80 - 2.50	1 / 3	1.80	1.80	CAA01-DW03-1108	1.32	0.45	2.08	1.27	2.52	0 / 3	0.72	--	-- / --	--	NO	--	--	NO	NO
Magnesium [2]	-- - --	3 / 3	2,200	6,800	CAA01-DW02-1108	3,827	2,579	8,174	3,335	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	3 / 3	67.8	228	CAA01-DW03-1108	132	84.9	275	115	120	1 / 3	1.90	49.5	3 / 3	4.61	**YES**	2.29	1.10	**YES**	NO
Nickel	5.80 - 5.80	1 / 3	19.6	19.6	CAA01-DW03-1108	8.47	9.64	24.7	5.48	52.0	0 / 3	0.38	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	3 / 3	1,140	4,720	CAA01-DW02-1108	2,423	1,994	5,784	1,965	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	3 / 3	6,340	8,300	CAA01-DW03-1108	7,527	1,043	9,286	7,476	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	0.42 - 0.42	2 / 3	1.30	2.90	CAA01-DW01-1108	1.47	1.35	3.75	0.93	20.0	0 / 3	0.15	--	-- / --	--	NO	--	--	NO	NO
Zinc	5.00 - 12.9	1 / 3	22.8	22.8	CAA01-DW03-1108	10.6	10.8	28.7	7.16	118	0 / 3	0.19	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-13
Exceedances - AOC 1 North Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	**95% UTL Cornwallis Cave**	CAA01-DW01	CAA01-DW02	CAA01-DW03
Sample ID			CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108
Sample Date			11/03/08	11/03/08	11/04/08
Volatile Organic Compounds (UG/L)					
Acetone	1,500	--	10 U	3 B	**3 J**
Semivolatile Organic Compounds (UG/L)					
No Detections	--	--	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/L)					
No Detections	--	--	NA	NA	NA
Explosives (UG/L)					
No Detections	--	--	NA	NA	NA
Inorganics (UG/L)					
Aluminum	87.0	2,230	**11,200**	**3,420**	**142,000**
Antimony	30.0	18.8	**2.9 J**	**3.2 J**	**13.3 L**
Arsenic	150	2.28	61.7 B	**18.4**	**731**
Barium	4.00	118	**91.4 J**	**73.1 J**	**931**
Beryllium	0.66	2.45	**0.80 J**	**0.23 J**	**11.7**
Cadmium	0.27	0.61	0.38 B	0.21 B	**1.7 J**
Chromium	11.4	15.1	**61.5**	21.8 B	**1,050**
Cobalt	23.0	20.6	**7.3 J**	**2.8 J**	**90.5 J**
Copper	9.33	12.2	**14.8 J**	11.1 B	**170**
Iron	1,000	3,590	**29,200**	**8,440**	**449,000**
Lead	3.18	21.3	**11.2**	3.7 B	**130**
Manganese	120	57.9	**162**	**143**	**2,600**
Nickel	52.2	11.4	20.2 B	14 B	**323**
Selenium	5.00	--	6.9 B	35 U	**64.4 J**
Silver	0.36	--	**0.44 J**	10 U	20 U
Vanadium	20.0	26.2	**60.3**	**18.2 J**	**821**
Zinc	120	4.52	**62.6**	22.7 B	**758**
Dissolved Metals (UG/L)					
Aluminum	87.0	100	**723**	**187 J**	**384**
Antimony	30.0	9.70	**1.1 J**	**1.1 J**	60 U
Arsenic	150	1.37	6.5 B	3.3 B	**4.3 J**
Barium	4.00	127	**43.4 J**	**61.9 J**	**54.4 J**
Chromium	11.0	6.04	**3.7 J**	**0.82 J**	**2.4 J**
Cobalt	23.0	0.70	**1.5 J**	**1.4 J**	**3.0 J**
Iron	1,000	631	**1,760**	**261**	**4,150**
Lead	2.52	1.70	2.5 B	1.8 B	**1.8 J**
Manganese	120	49.5	**67.8**	**99.2**	**228**
Nickel	52.0	12.2	5.8 B	5.8 B	**19.6 J**
Vanadium	20.0	4.30	**2.9 J**	0.42 B	**1.3 J**
Zinc	118	--	12.9 B	5.0 B	**22.8 J**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-14

Ecological Screening Statistics - AOC 1 South Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Volatile Organic Compounds (UG/L)																				
Acetone	2.00 - 4.00	1 / 4	2.00	2.00	CAA01-DW04-1108	1.63	0.48	2.19	1.57	1,500	0 / 4	0.001	--	-- / --	--	NO	--	--	NO	NO
Semivolatile Organic Compounds (UG/L)																				
2-Methylnaphthalene	10.0 - 10.0	1 / 4	7.00	7.00	CAA01-DW06-1208	5.50	1.00	6.68	5.44	330	0 / 4	0.02	--	-- / --	--	NO	--	--	NO	NO
Inorganics (UG/L)																				
Aluminum	-- - --	4 / 4	147	114,000	CAA01-DW04-1108	29,217	56,525	95,729	2,357	87.0	4 / 4	1,310	2,230	1 / 4	51.1	**(NO)**	1,100	336	**(NO)**	**(NO)**
Antimony	60.0 - 60.0	2 / 3	1.10	1.70	CAA01-DW06-1208	10.9	16.5	38.8	3.83	30.0	0 / 3	0.06	--	-- / --	--	NO	--	--	NO	NO
Arsenic	4.20 - 12.1	1 / 4	46.6	46.6	CAA01-DW04-1108	15.0	21.1	39.9	7.47	150	0 / 4	0.31	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	33.9	365	CAA01-DW04-1108	141	152	320	93.5	4.00	4 / 4	91.3	118	1 / 4	3.09	**(NO)**	80.0	35.1	**(NO)**	NO
Beryllium	5.00 - 5.00	1 / 4	2.60	2.60	CAA01-DW04-1108	2.53	0.050	2.58	2.52	0.66	1 / 4	3.94	2.45	1 / 4	1.06	**(NO)**	3.91	3.83	**(NO)**	NO
Cadmium	0.070 - 0.13	1 / 4	1.70	1.70	CAA01-DW04-1108	0.46	0.83	1.43	0.11	0.27	1 / 4	6.28	0.61	1 / 4	2.81	**(NO)**	5.29	1.70	**(NO)**	NO
Calcium [2]	-- - --	4 / 4	103,000	180,000	CAA01-DW05-1208	136,750	32,284	174,738	133,995	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	10.0 - 10.0	3 / 4	0.58	139	CAA01-DW04-1108	36.6	68.3	117	5.33	11.4	1 / 4	12.2	15.1	1 / 4	9.21	**(NO)**	10.3	3.21	**(NO)**	NO
Cobalt	0.39 - 0.87	1 / 4	16.8	16.8	CAA01-DW04-1108	4.41	8.26	14.1	0.74	23.0	0 / 4	0.73	--	-- / --	--	NO	--	--	NO	NO
Copper	-- - --	4 / 4	1.10	49.2	CAA01-DW04-1108	16.0	22.5	42.4	6.60	9.33	2 / 4	5.27	12.2	1 / 4	4.03	**(NO)**	4.55	1.72	**(NO)**	NO
Iron	21.6 - 21.6	3 / 4	2,720	111,000	CAA01-DW04-1108	32,933	52,644	94,878	2,768	1,000	3 / 4	111	3,590	2 / 4	30.9	**(NO)**	94.9	32.9	**(NO)**	**(NO)**
Lead	-- - --	4 / 4	1.10	93.8	CAA01-DW04-1108	25.1	45.8	79.0	4.96	3.18	2 / 4	29.5	21.3	1 / 4	4.40	**(NO)**	24.8	7.88	**(NO)**	NO
Magnesium [2]	-- - --	4 / 4	1,860	11,100	CAA01-DW04-1108	5,878	4,109	10,713	4,746	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	6.20	805	CAA01-DW04-1108	477	385	930	188	120	3 / 4	6.71	57.9	3 / 4	13.9	**(NO)**	7.75	3.98	**(NO)**	NO
Mercury	0.20 - 0.20	1 / 4	0.18	0.18	CAA01-DW04-1108	0.12	0.040	0.17	0.12	0.91	0 / 4	0.20	--	-- / --	--	NO	--	--	NO	NO
Nickel	-- - --	4 / 4	0.45	61.1	CAA01-DW04-1108	16.3	29.9	51.5	2.96	52.2	1 / 4	1.17	11.4	1 / 4	5.36	**(NO)**	0.99	0.31	NO	NO
Potassium [2]	-- - --	4 / 4	1,650	6,680	CAA01-DW04-1108	3,578	2,178	6,141	3,142	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Selenium	35.0 - 35.0	1 / 4	1.00	1.00	CAA01-DW04-1108	13.4	8.25	23.1	8.56	5.00	0 / 4	0.20	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	4 / 4	5,790	8,680	CAA01-DW05-1208	7,385	1,254	8,861	7,301	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	50.0 - 50.0	3 / 4	1.40	175	CAA01-DW04-1108	50.8	83.5	149	10.4	20.0	1 / 4	8.75	26.2	1 / 4	6.68	**(NO)**	7.45	2.54	**(NO)**	NO
Zinc	-- - --	4 / 4	3.10	215	CAA01-DW04-1108	58.7	104	181	13.2	120	1 / 4	1.79	4.52	2 / 4	47.6	**(NO)**	1.51	0.49	NO	NO
Dissolved Metals (UG/L)																				
Aluminum	73.2 - 73.2	3 / 4	134	513	CAA01-DW06-1208	215	207	459	145	87.0	3 / 4	5.90	100	3 / 4	5.13	**YES**	5.28	2.48	**YES**	NO
Antimony	60.0 - 60.0	2 / 4	0.88	2.50	CAA01-DW06-1208	15.8	16.4	35.1	6.67	30.0	0 / 4	0.08	--	-- / --	--	NO	--	--	NO	NO
Arsenic	4.30 - 9.20	2 / 4	10.6	25.4	CAA01-DW04-1108	10.7	10.4	23.0	7.18	150	0 / 4	0.17	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	54.2	192	CAA01-DW06-1208	107	59.3	177	96.4	4.00	4 / 4	48.0	127	1 / 4	1.51	**YES**	44.2	26.8	**YES**	NO
Calcium [2]	-- - --	4 / 4	138,000	474,000	CAA01-DW06-1208	232,000	162,204	422,862	200,437	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	10.0 - 10.0	3 / 4	0.42	0.58	CAA01-DW06-1208	1.62	2.25	4.27	0.87	11.0	0 / 4	0.05	--	-- / --	--	NO	--	--	NO	NO
Cobalt	0.25 - 50.0	1 / 4	0.52	0.52	CAA01-DW04-1108	6.45	12.4	21.0	0.71	23.0	0 / 4	0.02	--	-- / --	--	NO	--	--	NO	NO
Copper	1.30 - 25.0	2 / 4	2.00	6.40	CAA01-DW06-1208	5.39	5.34	11.7	3.19	8.96	0 / 4	0.71	--	-- / --	--	NO	--	--	NO	NO
Iron	100 - 100	3 / 4	3,500	49,100	CAA01-DW04-1108	17,238	22,362	43,551	3,440	1,000	3 / 4	49.1	631	3 / 4	77.8	**YES**	43.6	17.2	**YES**	**YES**
Lead	-- - --	4 / 4	1.00	2.90	CAA01-DW06-1208	1.70	0.85	2.70	1.56	2.52	1 / 4	1.15	1.70	2 / 4	1.71	**YES**	1.07	0.68	NO	NO
Magnesium [2]	-- - --	4 / 4	10.7	6,940	CAA01-DW04-1108	4,305	3,268	8,151	1,152	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	15.0 - 15.0	3 / 4	306	749	CAA01-DW05-1208	437	347	845	185	120	3 / 4	6.24	49.5	3 / 4	15.1	**YES**	7.04	3.64	**YES**	NO
Nickel	-- - --	4 / 4	0.53	13.6	CAA01-DW04-1108	6.36	6.74	14.3	2.71	52.0	0 / 4	0.26	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	4 / 4	1,500	8,120	CAA01-DW06-1208	3,833	2,942	7,295	3,145	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Silver	10.0 - 10.0	1 / 4	0.34	0.34	CAA01-DW05-1208	3.84	2.33	6.58	2.55	0.36	0 / 4	0.94	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	4 / 4	6,240	14,000	CAA01-DW06-1208	9,203	3,345	13,138	8,798	--	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	50.0 - 50.0	3 / 4	0.44	0.60	CAA01-DW04-1108	6.66	12.2	21.0	1.40	20.0	0 / 4	0.03	--	-- / --	--	NO	--	--	NO	NO
Zinc	-- - --	4 / 4	2.30	82.6	CAA01-DW04-1108	22.7	40.0	69.7	6.27	118	0 / 4	0.70	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-15
Exceedances - AOC 1 South Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	Eco Surface Water Screening Value - Fresh	95% UTL Cornwallis Cave	CAA01-DW04		CAA01-DW05		CAA01-DW06	CAA01-DW07
Sample ID			CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208	CAA01-DW06-1208	CAA01-DW07-1208
Sample Date			11/05/08	11/05/08	12/18/08	12/18/08	12/18/08	12/19/08
Volatile Organic Compounds (UG/L)								
Acetone	1,500	--	**2 J**	**2 J**	4 B	4 B	3 B	2 B
Semivolatile Organic Compounds (UG/L)								
2-Methylnaphthalene	330	--	10 U	9 U	9 U	10 U	**7 J**	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)								
No Detections	--	--	NA	NA	NA	NA	NA	NA
Explosives (UG/L)								
No Detections	--	--	NA	NA	NA	NA	NA	NA
Inorganics (UG/L)								
Aluminum	87.0	2,230	**102,000**	**114,000**	**1,280**	**1,000**	**1,440**	**147 J**
Antimony	30.0	18.8	60 R	60 R	**1.0 J**	**1.1 J**	**1.7 J**	60 U
Arsenic	150	2.28	**45.2**	**46.6**	12.1 B	11.4 B	4.2 B	10.5 B
Barium	4.00	118	**337**	**365**	**104 J**	**101 J**	**33.9 J**	**59.4 J**
Beryllium	0.66	2.45	**2.3 J**	**2.6 J**	5 U	5 U	5 U	5 U
Cadmium	0.271	0.605	**1.7 J**	**1.5 J**	0.13 B	0.08 B	0.07 B	0.07 B
Chromium	11.4	15.1	**127**	**139**	**2.0 J**	**1.6 J**	10 U	**0.58 J**
Cobalt	23.0	20.6	**15.8 J**	**16.8 J**	0.3 B	0.39 B	0.43 B	0.87 B
Copper	9.33	12.2	**43.4**	**49.2**	**8.8 J**	**10.3 J**	**3.4 J**	**1.1 J**
Iron	1,000	3,590	**104,000**	**111,000**	**18,000**	**17,700**	21.6 B	**2,720**
Lead	3.18	21.3	**82.7**	**93.8**	**3.9 J**	**3.8 J**	**1.1 J**	**1.5 J**
Manganese	120	57.9	**791**	**805**	**778**	**769**	**6.2 J**	**320**
Mercury	0.91	0.081	**0.18 J**	**0.15 J**	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel	52.2	11.4	**56.7**	**61.1**	**1.0 J**	**0.9 J**	**2.8 J**	**0.45 J**
Selenium	5.00	--	35 U	**1 J**	35 U	35 U	35 U	35 U
Vanadium	20.0	26.2	**164**	**175**	**1.9 J**	**1.1 J**	**1.4 J**	50 U
Zinc	120	4.52	**205**	**215**	**13.3 J**	**9.6 J**	**3.1 J**	**3.4 J**
Dissolved Metals (UG/L)								
Aluminum	87.0	100	**167 J**	**178 J**	73.2 B	68.4 B	**513**	**134 J**
Antimony	30.0	9.70	60 U	60 U	60 U	**0.88 J**	**2.5 J**	60 U
Arsenic	150	1.37	**25.4**	**25.0**	**10.6**	9.2 B	4.3 B	9.2 B
Barium	4.00	127	**87.5 J**	**85.0 J**	**94.7 J**	**92.3 J**	**192 J**	**54.2 J**
Chromium	11.0	6.04	10 U	10 U	10 U	**0.42 J**	**0.58 J**	**0.48 J**
Cobalt	23.0	0.70	**0.52 J**	**0.32 J**	50 U	0.29 B	0.25 B	0.32 B
Copper	8.96	3.00	1.0 B	1.3 B	**1.4 J**	**2.0 J**	**6.4 J**	25 U
Iron	1,000	631	**49,100**	**48,600**	**16,300**	**14,000**	100 U	**3,500**
Lead	2.52	1.70	2.2 B	**1.7 J**	**1.0 J**	10 U	**2.9 J**	**1.2 J**
Manganese	120	49.5	**685**	**680**	**749**	**749**	15 U	**306**
Nickel	52.0	12.2	**13.6 J**	**12.4 J**	40 U	**0.53 J**	**10.6 J**	**0.71 J**
Silver	0.36	--	0.43 B	10 U	10 U	**0.34 J**	10 U	10 U
Vanadium	20.0	4.30	**0.54 J**	**0.6 J**	50 U	50 U	**0.58 J**	**0.44 J**
Zinc	118	--	**82.6**	**78.0**	**2.7 J**	**2.8 J**	**2.3 J**	**2.9 J**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-16

Ecological Screening Statistics - AOC 2 Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDE	3.90 - 4.80	1 / 6	520	520	CAA02-A2-HA02-00-1098	88.5	211	262	5.39	114	1 / 6	4.56	--	-- / --	--	**YES**	2.30	0.78	NO
4,4'-DDT	3.90 - 4.80	1 / 6	640	640	CAA02-A2-HA02-00-1098	108	260	323	5.58	100	1 / 6	6.40	--	-- / --	--	**YES**	3.23	1.08	**YES**
Heptachlor epoxide	2.00 - 25.0	1 / 6	4.00	4.00	CAA02-A2-HA01-00-1098	3.48	4.57	7.24	2.04	52.9	0 / 6	0.08	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	6 / 6	1,890	8,500	CAA02-A2-DPB03-00-1098	5,870	2,235	7,708	5,346	pH < 5.5	-- / --	--	12,200	0 / 6	0.70	NO	--	--	NO
Antimony	0.55 - 0.72	1 / 6	0.74	0.74	CAA02-A2-HA01-00-1098	0.39	0.18	0.53	0.36	78.0	0 / 6	0.01	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	6 / 6	3.00	20.0	CAA02-A2-DPB03-00-1098	8.77	6.78	14.3	6.89	18.0	1 / 6	1.11	6.36	3 / 6	3.14	**YES**	0.80	0.49	NO
Barium	-- - --	6 / 6	18.4	77.2	CAA02-A2-HA01-00-1098	44.4	19.4	60.4	40.8	330	0 / 6	0.23	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	6 / 6	0.14	0.77	CAA02-A2-DPB03-00-1098	0.44	0.24	0.64	0.37	40.0	0 / 6	0.02	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	6 / 6	989	3,190	CAA02-A2-HA01-00-1098	2,418	873	3,136	2,244	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	6 / 6	3.90	39.0	CAA02-A2-HA01-00-1098	18.6	13.0	29.3	14.6	64.0	0 / 6	0.61	--	-- / --	--	NO	--	--	NO
Cobalt	1.50 - 1.50	5 / 6	2.40	6.10	CAA02-A2-DPB03-00-1098	3.64	2.04	5.32	3.00	13.0	0 / 6	0.47	--	-- / --	--	NO	--	--	NO
Copper	-- - --	6 / 6	2.20	20.5	CAA02-A2-HA01-00-1098	7.18	6.88	12.8	5.25	70.0	0 / 6	0.29	--	-- / --	--	NO	--	--	NO
Iron	-- - --	6 / 6	3,180	44,000	CAA02-A2-DPB03-00-1098	19,897	14,306	31,665	15,185	5 < pH > 8	-- / --	--	19,900	2 / 6	2.21	**YES**	--	--	**YES**
Lead	-- - --	6 / 6	8.00	104	CAA02-A2-HA01-00-1098	44.1	41.8	78.5	28.9	120	0 / 6	0.87	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	6 / 6	269	1,050	CAA02-A2-DPB03-00-1098	643	301	891	580	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	6 / 6	62.7	240	CAA02-A2-HA01-00-1098	162	57.2	209	150	220	1 / 6	1.09	324	0 / 6	0.74	NO	--	--	NO
Mercury	0.13 - 0.13	5 / 6	0.96	1.80	CAA02-A2-DPB01-00-1098	1.12	0.59	1.60	0.79	0.10	5 / 6	18.0	0.111	5 / 6	16.2	**YES**	16.0	11.2	**YES**
Nickel	2.30 - 2.30	5 / 6	4.00	12.5	CAA02-A2-HA01-00-1098	7.04	4.50	10.7	5.47	38.0	0 / 6	0.33	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	6 / 6	204	1,320	CAA02-A2-DPB03-00-1098	685	385	1,001	588	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	0.53 - 0.66	2 / 6	0.64	0.71	CAA02-A2-DPB04-00-1098	0.42	0.20	0.59	0.39	0.52	2 / 6	1.37	0.51	2 / 6	1.39	**YES**	1.13	0.81	NO
Sodium [2]	-- - --	6 / 6	106	158	CAA02-A2-HA02-00-1098	133	16.7	147	132	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	6 / 6	6.00	42.3	CAA02-A2-DPB03-00-1098	23.9	12.2	33.9	20.5	130	0 / 6	0.33	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	6 / 6	9.50	96.9	CAA02-A2-HA02-00-1098	43.3	32.2	69.8	33.2	120	0 / 6	0.81	--	-- / --	--	NO	--	--	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-17
Exceedances - AOC 2 Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA002-A2DPB01	CAA002-A2DPB02	CAA002-A2DPB03	CAA002-A2DPB04	CAA002-A2HA01		CAA002-A2HA02
Sample ID			CAA02-A2-DPB01-00-1098	CAA02-A2-DPB02-00-1098	CAA02-A2-DPB03-00-1098	CAA02-A2-DPB04-00-1098	CAA02-A2-HA01-00-1098	CAA02-A2-HA01-00D-1098	CAA02-A2-HA02-00-1098
Sample Date			10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Volatile Organic Compounds (UG/KG)									
No Detections	114	--	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)									
No Detections	114	--	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDE	114	--	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	**520 J**
4,4'-DDT	100	--	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	**640 J**
Heptachlor epoxide	52.9	--	2.1 UJ	2.4 UJ	2.3 UJ	2.0 UJ	2.0 UJ	**4.0 J**	25.0 UJ
Explosives (UG/KG)									
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)									
Aluminum	pH < 5.5	12,200	**1,890**	**5,710**	**8,500**	**5,650**	**6,020**	**7,300**	**6,170**
Antimony	78.0	11.0	0.58 UL	0.68 UL	0.63 UL	0.55 UL	0.56 UL	**0.74 L**	0.72 UL
Arsenic	18.0	6.36	**3.00**	**3.50**	**20.0**	**5.50**	**11.1**	**14.0**	**6.60**
Barium	330	52.9	**18.4 J**	**36.5 J**	**38.7 J**	**48.6**	**64.5**	**77.2**	**47.2 J**
Beryllium	40.0	0.587	**0.14 J**	**0.20 J**	**0.77 J**	**0.43 J**	**0.55 J**	**0.64 J**	**0.43 J**
Chromium	64.0	18.2	**3.90**	**12.5**	**29.4**	**11.5**	**24.6**	**39.0**	**15.3**
Cobalt	13.0	9.93	1.50 U	**2.40 J**	**6.10 J**	**2.80 J**	**4.10 J**	**5.60 J**	**4.20 J**
Copper	70.0	4.25	**2.20 J**	**2.40 J**	**7.80**	**4.00**	**20.2**	**20.5**	**6.20**
Iron	5 < pH > 8	19,900	**3,180**	**13,800**	**44,000**	**15,000**	**22,700**	**28,600**	**14,800**
Lead	120	17.4	**13.3**	**8.00**	**29.3**	**20.0**	**57.1**	**104**	**89.9**
Manganese	220	324	**62.7**	**152**	**169**	**170**	**240**	**238**	**176**
Mercury	0.10	0.111	**1.80**	**1.40**	**1.20 J**	**1.30**	0.11 B	0.13 B	**0.96 J**
Nickel	38.0	9.52	2.3 U	**4.0 J**	**12.1**	**5.6 J**	**10.6**	**12.5**	**6.9 J**
Selenium	0.52	0.51	0.53 U	0.63 U	**0.64 K**	**0.71 K**	0.51 U	0.53 U	0.66 U
Vanadium	130	27.9	**6.0 J**	**25.4**	**42.3**	**20.5**	**24.8**	**30.2**	**18.7**
Zinc	120	26.5	**9.5**	**21.3**	**55.9**	**22.8**	**49.9**	**53.6**	**96.9**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-18

Ecological Screening Statistics - AOC 2 Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
Ethylbenzene	11.0 - 15.0	1 / 3	10.0	10.0	CAA02-A2-TP05-F-1199	7.67	2.25	11.5	7.44	1,815	0 / 3	0.01	--	-- / --	--	NO	--	--	NO
Semivolatile Organic Compounds (UG/KG)																			
Di-n-butylphthalate	370 - 490	1 / 3	65.0	65.0	CAA02-A2-TP05-F-1199	165	91.7	320	143	40,000	0 / 3	0.002	--	-- / --	--	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	41.0 - 460	1 / 3	150	150	CAA02-A2-TP05-F-1199	134	106	312	89.1	30,000	0 / 3	0.01	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDE	3.90 - 4.90	1 / 3	120	120	CAA02-A2-HA02-01-1098	41.5	68.0	156	8.31	114	1 / 3	1.05	--	-- / --	--	**YES**	1.37	0.36	NO
4,4'-DDT	3.90 - 4.90	1 / 3	51.0	51.0	CAA02-A2-HA02-01-1098	18.5	28.2	66.0	6.25	100	0 / 3	0.51	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	3 / 3	5,120	12,500	CAA02-A2-HA01-02-1098	8,023	3,934	14,655	7,446	pH < 5.5	-- / --	--	13,000	0 / 3	0.96	NO	--	--	NO
Antimony	0.50 - 11.9	1 / 3	1.00	1.00	CAA02-A2-HA01-02-1098	2.40	3.10	7.62	1.14	78.0	0 / 3	0.01	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	3 / 3	1.90	31.1	CAA02-A2-HA01-02-1098	12.6	16.1	39.7	6.62	18.0	1 / 3	1.73	5.54	1 / 3	5.61	**YES**	2.21	0.70	NO
Barium	-- - --	3 / 3	26.0	35.3	CAA02-A2-HA02-01-1098	31.6	4.93	39.9	31.3	330	0 / 3	0.11	--	-- / --	--	NO	--	--	NO
Beryllium	0.23 - 0.23	2 / 3	0.36	0.96	CAA02-A2-HA01-02-1098	0.48	0.43	1.21	0.34	40.0	0 / 3	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.060 - 1.00	1 / 3	0.34	0.34	CAA02-A2-HA01-02-1098	0.29	0.24	0.69	0.17	32.0	0 / 3	0.01	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	3 / 3	885	1,720	CAA02-A2-HA01-02-1098	1,298	418	2,002	1,252	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	3 / 3	9.20	43.2	CAA02-A2-HA01-02-1098	21.6	18.8	53.3	17.0	64.0	0 / 3	0.68	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	3 / 3	2.70	7.00	CAA02-A2-HA01-02-1098	4.47	2.25	8.26	4.12	13.0	0 / 3	0.54	--	-- / --	--	NO	--	--	NO
Copper	3.10 - 3.10	2 / 3	4.20	4.70	CAA02-A2-HA02-01-1098	3.48	1.69	6.34	3.13	70.0	0 / 3	0.07	--	-- / --	--	NO	--	--	NO
Iron	-- - --	3 / 3	10,800	42,000	CAA02-A2-HA01-02-1098	22,500	17,000	51,159	18,822	5 < pH > 8	-- / --	--	32,000	1 / 3	1.31	**YES**	--	--	**NO**
Lead	-- - --	3 / 3	8.00	18.9	CAA02-A2-HA02-01-1098	12.7	5.59	22.2	12.0	120	0 / 3	0.16	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	3 / 3	293	1,510	CAA02-A2-HA01-02-1098	755	659	1,866	589	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	3 / 3	79.5	103	CAA02-A2-TP05-F-1199	94.1	12.8	116	93.5	220	0 / 3	0.47	--	-- / --	--	NO	--	--	NO
Mercury	-- - --	3 / 3	0.060	1.00	CAA02-A2-HA02-01-1098	0.65	0.51	1.52	0.38	0.10	2 / 3	10.0	0.14	2 / 3	7.14	**YES**	15.2	6.50	**YES**
Nickel	-- - --	3 / 3	4.30	21.8	CAA02-A2-HA01-02-1098	10.9	9.51	26.9	8.52	38.0	0 / 3	0.57	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	3 / 3	332	1,900	CAA02-A2-HA01-02-1098	902	867	2,364	669	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	0.46 - 1.00	1 / 3	0.68	0.68	CAA02-A2-HA01-02-1098	0.47	0.23	0.85	0.43	0.52	1 / 3	1.31	0.64	1 / 3	1.06	**YES**	1.64	0.90	NO
Sodium [2]	20.4 - 20.4	2 / 3	109	155	CAA02-A2-HA01-02-1098	91.4	74.0	216	55.6	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	3 / 3	16.8	39.8	CAA02-A2-HA01-02-1098	25.1	12.8	46.6	23.2	130	0 / 3	0.31	--	-- / --	--	NO	--	--	NO
Zinc	23.7 - 23.7	2 / 3	49.8	49.9	CAA02-A2-HA01-02-1098	37.2	21.9	74.2	30.9	120	0 / 3	0.42	--	-- / --	--	NO	--	--	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-19
Exceedances - AOC 2 Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA02-A2HA01		CAA02-A2HA02	CAA02-A2TP05F
Sample ID			CAA02-A2-HA01-02-1098	CAA02-A2-HA01-02D-1098	CAA02-A2-HA02-01-1098	CAA02-A2-TP05-F-1199
Sample Date			10/22/98	10/22/98	10/22/98	11/12/99
Volatile Organic Compounds (UG/KG)						
Ethylbenzene	1,815	--	14 U	15 U	11 U	**10 J**
Semivolatile Organic Compounds (UG/KG)						
Di-n-butylphthalate	40,000	--	460 UJ	490 UJ	370 UJ	**65 J**
bis(2-Ethylhexyl)phthalate	30,000	--	460 UJ	53 BJ	41 BJ	**150 J**
Pesticide/Polychlorinated Biphenyls (UG/KG)						
4,4'-DDE	114	--	4.6 UJ	4.9 UJ	**120 J**	3.9 UL
4,4'-DDT	100	--	4.6 UJ	4.9 UJ	**51 J**	3.9 UL
Explosives (UG/KG)						
No Detections	--	--	NA	NA	NA	NA
Inorganics (MG/KG)						
Aluminum	pH < 5.5	13,000	**12,500**	**11,000**	**6,450**	**5,120 L**
Antimony	78.0	--	**1.00 L**	**0.96 L**	0.50 UL	11.9 U
Arsenic	18.0	5.54	**30.8**	**31.1**	**4.90**	**1.90 J**
Barium	330	84.5	**33.5 J**	**32.5 J**	**35.3 J**	**26.0 J**
Beryllium	40.0	0.52	**0.96 J**	**0.85 J**	**0.36 J**	0.23 B
Cadmium	32.0	--	**0.34 J**	**0.3 J**	0.06 B	1 U
Chromium	64.0	33.7	**43.2**	**40.7**	**12.4**	**9.2**
Cobalt	13.0	5.18	**7.00 J**	**6.50 J**	**3.70 J**	**2.70 J**
Copper	70.0	3.17	**4.20**	**3.70**	**4.70**	3.10 B
Iron	5 < pH > 8	32,000	**42,000**	**38,400**	**14,700**	**10,800 L**
Lead	120	8.79	**11.3**	**9.80**	**18.9**	**8.00**
Manganese	220	176	**79.5**	**74.6**	**99.9**	**103**
Mercury	0.10	0.14	0.08 B	**0.89 J**	**1.00**	**0.06 J**
Nickel	38.0	17.6	**21.8**	**21.2**	**6.60 J**	**4.30 J**
Selenium	0.52	0.64	**0.68 K**	0.63 U	0.46 U	1.00 U
Vanadium	130	48.3	**39.8**	**34.9**	**18.6**	**16.8**
Zinc	120	28.0	**49.9**	**47.4**	**49.8**	23.7 B

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-20

Ecological Screening Statistics - AOC 6 Ammonia Settling Pit Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																			
Benzo(a)anthracene	400 - 510	2 / 5	230	230	CAA06-SS05-1008	225	21.2	245	224	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(a)pyrene	400 - 510	2 / 5	220	270	CAA06-SS05-1008	231	30.1	260	229	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(b)fluoranthene	400 - 510	2 / 5	200	230	CAA06-SS05-1008	219	23.6	241	218	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(g,h,i)perylene	400 - 510	2 / 5	130	160	CAA06-SS05-1008	191	48.0	237	186	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(k)fluoranthene	400 - 510	2 / 5	170	190	CAA06-SS05-1008	205	31.6	235	203	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Chrysene	400 - 510	2 / 5	440	440	CAA06-SS05-1008	309	121	425	291	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Fluoranthene	400 - 510	2 / 5	240	320	CAA06-SS05-1008	245	47.4	290	242	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Indeno(1,2,3-cd)pyrene	380 - 510	1 / 5	100	100	CAA06-SS05-1008	191	56.6	245	183	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	1,800 - 1,890	3 / 5	2,210	2,600	CAA06-SS05-1008	1,805	818	2,584	1,632	18,000	0 / 5	0.14	--	-- / --	--	NO	--	--	NO
PAH (LMW)	1,800 - 2,295	2 / 5	1,780	1,930	CAA06-SS05-1008	1,341	482	1,800	1,274	29,000	0 / 5	0.07	--	-- / --	--	NO	--	--	NO
Phenanthrene	400 - 510	2 / 5	210	280	CAA06-SS05-1008	231	34.7	264	229	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
Pyrene	400 - 420	3 / 5	170	790	CAA06-SS05-1008	394	283	664	321	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Explosives (UG/KG)																			
1,3,5-Trinitrobenzene	100 - 100	2 / 5	120	2,100	CAA06-SS10-1108	474	909	1,341	126	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
1,3-Dinitrobenzene	100 - 100	1 / 5	100	100	CAA06-SS05-1008	60.0	22.4	81.3	57.4	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
2,4,6-Trinitrotoluene	100 - 100	3 / 5	150	2,900	CAA06-SS06-1008	828	1,224	1,995	255	10,000	0 / 5	0.29	--	-- / --	--	NO	--	--	NO
2,4-Dinitrotoluene	100 - 100	1 / 5	420	420	CAA06-SS05-1008	124	165	282	76.5	11,000	0 / 5	0.04	--	-- / --	--	NO	--	--	NO
2,6-Dinitrotoluene	100 - 100	1 / 5	510	510	CAA06-SS10-1108	142	206	338	79.6	8,500	0 / 5	0.06	--	-- / --	--	NO	--	--	NO
2-Amino-4,6-dinitrotoluene	100 - 100	1 / 5	120	120	CAA06-SS06-1008	64.0	31.3	93.8	59.6	80,000	0 / 5	0.002	--	-- / --	--	NO	--	--	NO
HMX	200 - 200	1 / 5	20,000	20,000	CAA06-SS10-1108	4,080	8,900	12,565	289	10,000	1 / 5	2.00	--	-- / --	--	**YES**	1.26	0.41	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	5 / 5	4,390	11,100	CAA06-SS05-1008	7,922	3,260	11,030	7,343	pH < 5.5	4 / 5	--	12,200	0 / 5	0.91	NO	--	--	NO
Antimony	4.80 - 6.30	2 / 5	0.060	0.73	CAA06-SS10-1108	1.89	1.41	3.24	1.01	78.0	0 / 5	0.01	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	5 / 5	1.80	3.90	CAA06-SS12-1108	2.96	0.91	3.83	2.84	18.0	0 / 5	0.22	--	-- / --	--	NO	--	--	NO
Barium	-- - --	5 / 5	16.1	31.4	CAA06-SS05-1008	21.5	7.32	28.5	20.6	330	0 / 5	0.10	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	5 / 5	0.17	0.42	CAA06-SS05-1008	0.29	0.11	0.40	0.28	40.0	0 / 5	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.030 - 0.53	2 / 5	0.080	0.090	CAA06-SS05-1008	0.094	0.10	0.19	0.056	32.0	0 / 5	0.003	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	5 / 5	185	1,760	CAA06-SS10-1108	604	657	1,231	421	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	5 / 5	5.00	13.8	CAA06-SS12-1108	10.2	4.00	14.0	9.46	64.0	0 / 5	0.22	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	5 / 5	0.78	2.40	CAA06-SS12-1108	1.59	0.75	2.30	1.43	13.0	0 / 5	0.18	--	-- / --	--	NO	--	--	NO
Copper	3.00 - 6.30	2 / 5	5.30	31.6	CAA06-SS06-1008	8.72	12.9	21.0	4.39	70.0	0 / 5	0.45	--	-- / --	--	NO	--	--	NO
Iron	-- - --	5 / 5	3,970	9,840	CAA06-SS12-1108	6,720	2,480	9,085	6,351	5 < pH > 8	3 / 5	--	19,900	0 / 5	0.49	NO	--	--	NO
Lead	-- - --	5 / 5	18.1	73.6	CAA06-SS06-1008	34.7	22.4	56.1	30.5	120	0 / 5	0.61	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	5 / 5	313	767	CAA06-SS05-1008	523	201	714	491	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	5 / 5	19.2	57.1	CAA06-SS12-1108	36.0	16.4	51.6	33.1	220	0 / 5	0.26	--	-- / --	--	NO	--	--	NO
Mercury	0.16 - 0.16	4 / 5	0.060	0.18	CAA06-SS06-1008	0.092	0.050	0.14	0.084	0.10	1 / 5	1.80	0.111	1 / 5	1.62	**YES**	1.40	0.92	NO
Nickel	-- - --	5 / 5	2.60	7.00	CAA06-SS05-1008	4.64	1.85	6.40	4.34	38.0	0 / 5	0.18	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	5 / 5	235	496	CAA06-SS05-1008	389	129	512	370	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.80 - 3.60	2 / 5	0.39	0.44	CAA06-SS12-1108	1.11	0.65	1.72	0.92	0.52	0 / 5	0.85	--	-- / --	--	NO	--	--	NO
Sodium [2]	20.4 - 45.0	2 / 5	34.2	51.1	CAA06-SS05-1008	25.7	17.3	42.2	21.2	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	5 / 5	10.6	22.2	CAA06-SS12-1108	16.9	5.32	21.9	16.2	130	0 / 5	0.17	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	5 / 5	9.80	30.1	CAA06-SS05-1008	19.6	7.44	26.7	18.3	120	0 / 5	0.25	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	5 / 5	26,000	50,000	CAA06-SS06-1008	37,200	10,060	46,791	36,081	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	5 / 5	4.30	6.30	CAA06-SS10-1108	5.02	0.77	5.75	4.98	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-21
Exceedances - AOC 6 Ammonia Settling Pit Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA06-SO05	CAA06-SO06		CAA06-SO10	CAA06-SO11	CAA06-SO12
Sample ID			CAA06-SS05-1008	CAA06-SS06-1008	CAA06-SS06P-1008	CAA06-SS10-1108	CAA06-SS11-1108	CAA06-SS12-1108
Sample Date			10/21/08	10/21/08	10/21/08	11/06/08	11/06/08	11/06/08
Semivolatile Organic Compounds (UG/KG)								
Benzo(a)anthracene	HMW PAH	--	**230 J**	**140 J**	**230 J**	510 U	420 U	400 U
Benzo(a)pyrene	HMW PAH	--	**270 J**	**140 J**	**220 J**	510 U	420 U	400 U
Benzo(b)fluoranthene	HMW PAH	--	**230 J**	**130 J**	**200 J**	510 U	420 U	400 U
Benzo(g,h,i)perylene	HMW PAH	--	**160 J**	380 U	**130 J**	510 U	420 U	400 U
Benzo(k)fluoranthene	HMW PAH	--	**190 J**	**110 J**	**170 J**	510 U	420 U	400 U
Chrysene	HMW PAH	--	**440**	**250 J**	**440**	510 U	420 U	400 U
Fluoranthene	LMW PAH	--	**320 J**	**160 J**	**240 J**	510 U	420 U	400 U
Indeno(1,2,3-cd)pyrene	HMW PAH	--	**100 J**	380 U	380 U	510 U	420 U	400 U
PAH (HMW)	18,000	--	**2,600 J**	**1,720 J**	**2,370 J**	**2,210 J**	1,890 U	1,800 U
PAH (LMW)	29,000	--	**1,930 J**	**1,610 J**	**1,780 J**	2,295 U	1,890 U	1,800 U
Phenanthrene	LMW PAH	--	**280 J**	**120 J**	**210 J**	510 U	420 U	400 U
Pyrene	HMW PAH	--	**790**	**380 J**	**600**	**170 J**	420 U	400 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	--	--	100 U	**120**	100 U	**2,100**	100 U	100 U
1,3-Dinitrobenzene	--	--	**100**	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	10,000	--	**990**	**2,000**	**2,900**	**150**	100 U	100 U
2,4-Dinitrotoluene	11,000	--	**420**	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	8,500	--	100 U	100 U	100 U	**510**	100 U	100 U
2-Amino-4,6-dinitrotoluene	80,000	--	100 U	**120**	**110**	100 U	100 U	100 U
HMX	10,000	--	200 U	200 U	200 U	**20,000**	200 U	200 U
Inorganics (MG/KG)								
Aluminum	pH < 5.5	12,200	**11,100**	**4,800**	**4,800**	**8,220**	**4,390**	**11,100**
Antimony	78.0	11.0	6.2 UL	**0.06 L**	**0.06 L**	**0.73 L**	4.8 UL	6.3 UL
Arsenic	18.0	6.36	**3.6 J**	**2.2 J**	**2.0 J**	**3.3 L**	**1.8 L**	**3.9 L**
Barium	330	52.9	**31.4**	**16.2 J**	**14.6 J**	**16.6 K**	**16.1 K**	**27.4 K**
Beryllium	40.0	0.587	**0.42 J**	**0.17 J**	**0.15 J**	**0.27 J**	**0.22 J**	**0.39 J**
Cadmium	32.0	1.50	**0.09 J**	**0.08 J**	**0.07 J**	0.04 B	0.03 B	0.53 U
Chromium	64.0	18.2	**12.9 L**	**6.7 L**	**6.8 L**	**12.5**	**5.0**	**13.8**
Cobalt	13.0	9.93	**2.2 J**	**0.86 J**	**0.85 J**	**1.7 J**	**0.78 J**	**2.4 J**
Copper	70.0	4.25	**5.3**	**31.6**	**29.6**	6.3 B	3.0 B	4.1 B
Iron	5 < pH > 8	19,900	**8,680 J**	**4,860 J**	**4,940 J**	**6,170**	**3,970**	**9,840**
Lead	120	17.4	**22.6 J**	**69.6 J**	**73.6 J**	**26.4**	**33.0**	**18.1**
Manganese	220	324	**49.5**	**24.9**	**20.7**	**29.2 L**	**19.2 L**	**57.1 L**
Mercury	0.10	0.111	**0.06 L**	**0.14**	**0.18**	0.16 UL	**0.08 L**	**0.06 L**
Nickel	38.0	9.52	**7.0**	**3.1 J**	**3.0 J**	**4.6**	**2.6 J**	**5.9**
Selenium	0.52	0.51	**0.39 J**	3.6 U	3.1 U	3.0 U	2.8 U	**0.44 J**
Vanadium	130	27.9	**22.0**	**12.5**	**12.4**	**17.0**	**10.6**	**22.2**
Zinc	120	26.5	**30.1**	**16.6**	**15.0**	**22.1 K**	**9.8 K**	**19.2 K**
Other Parameters								
Total organic carbon (MG/KG)	--	--	**42,000 J**	**50,000 J**	NA	**40,000**	**28,000**	**26,000**
pH	--	--	**4.9**	**4.3**	NA	**6.3**	**4.6**	**5.0**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-22

Ecological Screening Statistics - AOC 6 1918 Drum Storage Area Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Inorganics (MG/KG)																			
Aluminum	-- - --	6 / 6	5,040	12,800	CAA06-SS19-1108	8,415	2,521	10,489	8,110	pH < 5.5	1 / 6	--	12,200	1 / 6	1.05	**YES**	mean pH > 5.5		NO
Antimony	4.50 - 5.10	4 / 6	0.050	0.50	CAA06-SS15-1108	0.92	1.16	1.88	0.32	78.0	0 / 6	0.01	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	6 / 6	2.40	4.90	CAA06-SS19-1108	3.40	1.01	4.23	3.28	18.0	0 / 6	0.27	--	-- / --	--	NO	--	--	NO
Barium	-- - --	6 / 6	28.0	45.8	CAA06-SS18-1108	35.0	6.28	40.2	34.6	330	0 / 6	0.14	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	6 / 6	0.28	0.53	CAA06-SS14-1108	0.39	0.087	0.46	0.38	40.0	0 / 6	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	-- - --	6 / 6	0.020	0.17	CAA06-SS18-1108	0.088	0.062	0.14	0.069	32.0	0 / 6	0.01	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	6 / 6	560	8,080	CAA06-SS16-1108	2,175	2,927	4,583	1,304	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	6 / 6	6.30	16.7	CAA06-SS19-1108	11.6	3.58	14.5	11.1	64.0	0 / 6	0.26	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	6 / 6	1.10	2.00	CAA06-SS16-1108	1.62	0.33	1.89	1.59	13.0	0 / 6	0.15	--	-- / --	--	NO	--	--	NO
Copper	-- - --	6 / 6	4.20	8.20	CAA06-SS15-1108	5.73	1.59	7.04	5.56	70.0	0 / 6	0.12	--	-- / --	--	NO	--	--	NO
Iron	-- - --	6 / 6	5,440	11,000	CAA06-SS16-1108	7,998	2,262	9,859	7,741	5 < pH > 8	1 / 6	--	19,900	0 / 6	0.55	NO	--	--	NO
Lead	-- - --	6 / 6	23.3	128	CAA06-SS15-1108	57.3	38.6	89.0	48.3	120	1 / 6	1.07	16.3	6 / 6	7.85	**YES**	0.74	0.48	NO
Magnesium [2]	-- - --	6 / 6	410	1,070	CAA06-SS15-1108	840	260	1,054	798	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	6 / 6	55.9	95.1	CAA06-SS14-1108	71.8	14.9	84.1	70.5	220	0 / 6	0.43	--	-- / --	--	NO	--	--	NO
Mercury	0.10 - 0.12	3 / 6	0.060	0.060	CAA06-SS14-1108	0.058	0.0041	0.062	0.058	0.10	0 / 6	0.60	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	6 / 6	2.90	5.90	CAA06-SS16-1108	4.17	1.05	5.03	4.06	38.0	0 / 6	0.16	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	6 / 6	356	867	CAA06-SS19-1108	626	195	786	599	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.60 - 3.40	2 / 6	0.31	0.37	CAA06-SS19-1108	1.10	0.60	1.59	0.90	0.52	0 / 6	0.71	--	-- / --	--	NO	--	--	NO
Silver	0.65 - 0.96	1 / 6	0.62	0.62	CAA06-SS14-1108	0.43	0.10	0.52	0.42	560	0 / 6	0.001	--	-- / --	--	NO	--	--	NO
Sodium [2]	-- - --	6 / 6	22.6	80.5	CAA06-SS16-1108	38.0	21.6	55.8	34.4	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Thallium	1.60 - 2.40	2 / 6	0.060	0.070	CAA06-SS14-1108	0.69	0.50	1.10	0.40	1.00	0 / 6	0.07	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	6 / 6	8.90	23.4	CAA06-SS19-1108	15.8	4.69	19.7	15.2	130	0 / 6	0.18	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	6 / 6	22.2	102	CAA06-SS18-1108	49.5	30.9	74.9	42.3	120	0 / 6	0.85	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	6 / 6	8,700	23,000	CAA06-SS14-1108	17,950	6,411	23,224	16,774	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	6 / 6	5.00	8.40	CAA06-SS16-1108	6.30	1.14	7.24	6.22	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-23
Exceedances - AOC 6 1918 Drum Storage Area Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID			CAA06-SS14-1108	CAA06-SS15-1108	CAA06-SS16-1108	CAA06-SS17-1108	CAA06-SS18-1108	CAA06-SS19-1108	CAA06-SS19P-1108
Sample Date			11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Semivolatile Organic Compounds (UG/KG)									
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/KG)									
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)									
Aluminum	pH < 5.5	12,200	**7,560**	**8,530**	**8,710**	**7,850**	**5,040**	**10,300**	**12,800**
Antimony	78.0	11.0	**0.11 L**	**0.50 L**	**0.07 L**	**0.05 L**	4.5 UL	5.1 UL	5.1 UL
Arsenic	18.0	6.36	**3.1**	**3.0**	**4.4**	**2.4**	**2.6**	**4.1**	**4.9**
Barium	330	52.9	**31.0**	**35.4**	**32.2**	**28.0**	**45.8**	**32.0**	**37.7**
Beryllium	40.0	0.587	**0.53**	**0.35 J**	**0.42**	**0.34**	**0.28 J**	**0.36 J**	**0.42 J**
Cadmium	32.0	1.50	**0.07 J**	**0.16 J**	**0.07 J**	**0.04 J**	**0.17 J**	**0.02 J**	0.42 U
Chromium	64.0	18.2	**9.9**	**12.3**	**13.8**	**10.3**	**6.3**	**15.0**	**16.7**
Cobalt	13.0	9.93	**1.6 J**	**1.7 J**	**2.0 J**	**1.4 J**	**1.1 J**	**1.5 J**	**1.9 J**
Copper	70.0	4.25	**5.4**	**8.2**	**4.4**	**4.2**	**5.1**	**7.1**	**6.5**
Iron	5 < pH > 8	19,900	**7,740**	**6,860**	**11,000**	**6,450**	**5,440**	**9,450**	**10,500**
Lead	120	17.4	**57.6**	**128**	**27.2**	**23.3**	**67.4**	**34.9**	**40.2**
Manganese	220	324	**95.1**	**82.9**	**66.9**	**58.7**	**71.2**	**33.4**	**55.9**
Mercury	0.10	0.111	**0.06 J**	**0.06 J**	0.12 U	0.12 U	0.10 U	**0.06 J**	**0.06 J**
Nickel	38.0	9.52	**3.9**	**3.9**	**5.9**	**3.6**	**2.9 J**	**4.3**	**4.8**
Selenium	0.52	0.51	3.1 U	3.4 U	2.7 U	**0.31 J**	2.6 U	**0.35 J**	**0.37 J**
Silver	560	2.10	**0.62 J**	0.96 U	0.76 U	0.65 U	0.76 U	0.84 U	0.84 U
Thallium	1.00	--	**0.07 J**	2.4 U	**0.06 J**	1.6 U	1.9 U	2.1 U	2.1 U
Vanadium	130	27.9	**15.5**	**16.3**	**16.9**	**14.0**	**8.9**	**20.2**	**23.4**
Zinc	120	26.5	**51.3**	**66.2**	**31.1**	**22.2**	**102**	**23.9**	**24.1**
Other Parameters									
Total organic carbon (MG/KG)	--	--	**23,000**	**20,000**	**8,700**	**23,000**	**11,000**	**22,000**	NA
pH	--	--	**6.0**	**6.2**	**8.4**	**5.8**	**6.4**	**5.0**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-24

Ecological Screening Statistics - AOC 6 TNT Catch Box Ruins Surface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																			
2,4-Dinitrotoluene	380 - 460	3 / 7	140	4,000	CAA06-SS01-1008	738	1,439	1,795	296	11,000	0 / 7	0.36	--	-- / --	--	NO	--	--	NO
Benzaldehyde	370 - 460	1 / 7	320	320	CAA06-SS01-1008	217	48.3	253	213	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Benzo(a)anthracene	370 - 460	1 / 7	110	110	CAA06-SS01-1008	187	37.8	215	183	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Chrysene	370 - 460	1 / 7	150	150	CAA06-SS01-1008	193	25.1	211	191	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Fluoranthene	370 - 460	1 / 7	300	300	CAA06-SS01-1008	214	41.3	245	211	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	1,665 - 2,070	1 / 7	2,070	2,070	CAA06-SS01-1008	1,067	448	1,397	1,011	18,000	0 / 7	0.12	--	-- / --	--	NO	--	--	NO
PAH (LMW)	1,665 - 2,070	1 / 7	1,940	1,940	CAA06-SS01-1008	1,049	400	1,342	1,002	29,000	0 / 7	0.07	--	-- / --	--	NO	--	--	NO
Pyrene	370 - 460	1 / 7	580	580	CAA06-SS01-1008	254	145	360	232	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Explosives (UG/KG)																			
1,3,5-Trinitrobenzene	99.0 - 100	3 / 7	250	1,100	CAA06-SS13-1108	310	407	609	140	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
1,3-Dinitrobenzene	99.0 - 100	3 / 7	84.0	730	CAA06-SS01-1008	186	255	374	101	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
2,4,6-Trinitrotoluene	99.0 - 100	5 / 7	170	4,500,000	CAA06-SS01-1008	696,839	1,681,069	1,931,505	5,735	10,000	3 / 7	450	--	-- / --	--	**YES**	193	69.7	**YES**
2,4-Dinitrotoluene	99.0 - 100	2 / 7	290	6,300	CAA06-SS01-1008	977	2,349	2,702	128	11,000	0 / 7	0.57	--	-- / --	--	NO	--	--	NO
2-Amino-4,6-dinitrotoluene	99.0 - 100	3 / 7	1,400	16,000	CAA06-SS02-1008	4,657	7,429	10,113	414	80,000	0 / 7	0.20	--	-- / --	--	NO	--	--	NO
2-Nitrotoluene	200 - 200	1 / 6	48,000	48,000	CAA06-SS02-1008	8,083	19,555	24,170	280	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**YES**
3,5-Dinitroaniline	99.0 - 100	1 / 7	890	890	CAA06-SS13-1108	170	318	403	75.3	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
4-Amino-2,6-dinitrotoluene	99.0 - 100	3 / 6	1,400	17,000	CAA06-SS02-1008	5,425	7,879	11,906	588	80,000	0 / 6	0.21	--	-- / --	--	NO	--	--	NO
RDX	200 - 200	1 / 7	220	220	CAA06-SS01-1008	117	45.4	150	112	10,000	0 / 7	0.02	--	-- / --	--	NO	--	--	NO
Tetryl	200 - 200	1 / 7	640	640	CAA06-SS01-1008	177	204	327	130	10,000	0 / 7	0.06	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	7 / 7	5,230	25,000	CAA06-SS03-1008	11,291	6,443	16,023	10,101	pH < 5.5	4 / 7	--	12,200	1 / 7	2.05	**YES**	mean pH > 5.5		NO
Antimony	4.00 - 14.0	2 / 7	0.10	0.21	CAA06-SS03-1008	2.47	2.35	4.20	1.26	78.0	0 / 7	0.003	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	7 / 7	2.70	11.8	CAA06-SS03-1008	5.43	3.34	7.88	4.74	18.0	0 / 7	0.66	--	-- / --	--	NO	--	--	NO
Barium	-- - --	7 / 7	18.3	45.7	CAA06-SS03-1008	26.2	9.64	33.2	24.9	330	0 / 7	0.14	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	7 / 7	0.26	0.55	CAA06-SS03-1008	0.37	0.094	0.44	0.36	40.0	0 / 7	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.020 - 0.38	4 / 7	0.040	0.12	CAA06-SS03-1008	0.076	0.063	0.12	0.053	32.0	0 / 7	0.004	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	7 / 7	304	2,260	CAA06-SS01-1008	1,112	754	1,666	890	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	7 / 7	6.10	34.7	CAA06-SS03-1008	15.5	9.29	22.4	13.6	64.0	0 / 7	0.54	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	7 / 7	1.30	3.60	CAA06-SS01-1008	2.49	0.81	3.08	2.37	13.0	0 / 7	0.28	--	-- / --	--	NO	--	--	NO
Copper	2.20 - 4.80	4 / 7	3.60	9.80	CAA06-SS01-1008	4.46	3.07	6.71	3.56	70.0	0 / 7	0.14	--	-- / --	--	NO	--	--	NO
Cyanide	0.50 - 0.70	1 / 7	1.30	1.30	CAA06-SS13-1108	0.44	0.38	0.72	0.36	15.8	0 / 7	0.08	--	-- / --	--	NO	--	--	NO
Iron	-- - --	7 / 7	4,780	37,100	CAA06-SS01-1008	14,023	11,556	22,510	11,053	5 < pH > 8	1 / 7	--	19,900	2 / 7	1.86	**YES**	mean pH within range		NO
Lead	-- - --	7 / 7	9.90	580	CAA06-SS01-1008	119	206	271	44.8	120	1 / 7	4.83	17.4	5 / 7	33.3	**YES**	2.26	0.995	NO
Magnesium [2]	-- - --	7 / 7	406	1,270	CAA06-SS03-1008	736	288	948	691	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	7 / 7	25.4	175	CAA06-SS01-1008	57.0	52.7	95.7	45.5	220	0 / 7	0.80	--	-- / --	--	NO	--	--	NO
Mercury	0.11 - 0.15	4 / 7	0.050	0.13	CAA06-SS01-1008	0.073	0.027	0.093	0.069	0.10	1 / 7	1.30	0.111	1 / 7	1.17	**YES**	0.93	0.73	NO
Nickel	-- - --	7 / 7	3.70	10.1	CAA06-SS01-1008	6.61	2.64	8.55	6.17	38.0	0 / 7	0.27	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	7 / 7	254	1,520	CAA06-SS03-1008	716	406	1,014	629	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.60 - 4.30	4 / 7	0.38	2.00	CAA06-SS01-1008	1.29	0.75	1.84	1.05	0.52	2 / 7	3.85	0.51	2 / 7	3.92	**YES**	3.54	2.48	**YES**
Sodium [2]	19.0 - 36.3	4 / 7	28.6	68.0	CAA06-SS01-1008	32.3	22.6	48.9	25.9	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Thallium	0.090 - 5.70	1 / 7	0.18	0.18	CAA06-SS03-1008	1.11	0.95	1.81	0.63	1.00	0 / 7	0.18	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	7 / 7	10.3	50.0	CAA06-SS03-1008	24.2	12.5	33.3	21.9	130	0 / 7	0.38	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	7 / 7	12.2	176	CAA06-SS03-1008	57.3	60.3	102	36.9	120	1 / 7	1.47	26.5	3 / 7	6.64	**YES**	0.85	0.48	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	7 / 7	6,200	120,000	CAA06-SS01-1008	37,357	39,236	66,174	24,115	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	7 / 7	4.60	7.10	CAA06-SS03-1008	5.86	1.10	6.66	5.77	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-25
Exceedances - AOC 6 TNT Catch Box Ruins Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO07	CAA06-SO08	CAA06-SO13
Sample ID			CAA06-SS01-1008	CAA06-SS02-1008	CAA06-SS03-1008	CAA06-SS04-1008	CAA06-SS07-1108	CAA06-SS08-1108	CAA06-SS13-1108
Sample Date			10/20/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08
Semivolatile Organic Compounds (UG/KG)									
2,4-Dinitrotoluene	11,000	--	**4,000 J**	**140 J**	380 U	380 U	460 U	430 U	**200 J**
Benzaldehyde	--	--	**320 J**	380 U	380 U	380 U	460 U	430 U	370 U
Benzo(a)anthracene	HMW PAH	--	**110 J**	380 U	380 U	380 U	460 U	430 U	370 U
Chrysene	HMW PAH	--	**150 J**	380 U	380 U	380 U	460 U	430 U	370 U
Fluoranthene	LMW PAH	--	**300 J**	380 U	380 U	380 U	460 U	430 U	370 U
PAH (HMW)	18,000	--	**2,070 J**	1,710 U	1,710 U	1,710 U	2,070 U	1,935 U	1,665 U
PAH (LMW)	29,000	--	**1,940 J**	1,710 U	1,710 U	1,710 U	2,070 U	1,935 U	1,665 U
Pyrene	HMW PAH	--	**580 J**	380 U	380 U	380 U	460 U	430 U	370 U
Explosives (UG/KG)									
1,3,5-Trinitrobenzene	--	--	**620 K**	**250**	100 U	100 U	100 U	99 U	**1,100**
1,3-Dinitrobenzene	--	--	**730 J**	**84 J**	100 UJ	100 U	100 U	99 U	**290**
2,4,6-Trinitrotoluene	10,000	--	**4,500,000**	**320,000**	**6,600**	**170**	100 U	99 U	**51,000**
2,4-Dinitrotoluene	11,000	--	**6,300 L**	100 U	100 U	100 U	100 U	99 U	**290**
2-Amino-4,6-dinitrotoluene	80,000	--	100 UJ	**16,000 J**	**1,400 J**	100 U	100 U	99 U	**15,000**
2-Nitrotoluene	--	--	40,000 R	**48,000 J**	200 UJ	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	--	--	100 U	100 U	100 U	100 U	100 U	99 UJ	**890**
4-Amino-2,6-dinitrotoluene	80,000	--	20,000 R	**17,000**	**1,400**	100 U	100 U	99 U	**14,000**
RDX	10,000	--	**220**	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	10,000	--	**640**	200 U	200 U	200 U	200 U	200 U	200 U
Inorganics (MG/KG)									
Aluminum	pH < 5.5	12,200	**10,600**	**10,400**	**25,000**	**9,630**	**5,230**	**6,780**	**11,400**
Antimony	78.0	11.0	14 UL	4.1 UL	**0.21 L**	**0.10 L**	4.5 UL	7.4 UL	4.0 UL
Arsenic	18.0	6.36	**8.1 J**	**3.5 J**	**11.8 J**	**3.6 J**	**2.7 L**	**3.3 L**	**5.0 L**
Barium	330	52.9	**31.0**	**22.9**	**45.7**	**18.8 J**	**21.2 K**	**18.3 K**	**25.2 K**
Beryllium	40.0	0.587	**0.34 J**	**0.36**	**0.55**	**0.29 J**	**0.40**	**0.26 J**	**0.39**
Cadmium	32.0	1.50	**0.06 J**	**0.09 J**	**0.12 J**	**0.04 J**	0.38 U	0.05 B	0.02 B
Chromium	64.0	18.2	**16.8 L**	**12.5 L**	**34.7 L**	**16.2 L**	**6.1**	**8.6**	**13.9**
Cobalt	13.0	9.93	**3.6 J**	**2.2 J**	**3.4 J**	**1.9 J**	**2.6 J**	**1.3 J**	**2.4 J**
Copper	70.0	4.25	**9.8**	**6.7**	**5.5**	**3.6**	2.2 B	4.8 B	4.2 B
Cyanide	15.8	--	0.6 U	0.55 U	0.55 U	0.5 U	0.7 U	0.6 U	**1.3**
Iron	5 < pH > 8	19,900	**37,100 J**	**9,000 J**	**21,700 J**	**9,010 J**	**4,780**	**6,270**	**10,300**
Lead	120	17.4	**580 J**	**72.9 J**	**42.8 J**	**9.9 J**	**10.8**	**18.5**	**101**
Manganese	220	324	**175**	**43.3**	**32.8**	**25.4**	**50.5 L**	**30.9 L**	**41.1 L**
Mercury	0.10	0.111	**0.13 L**	**0.05 L**	0.12 UL	0.11 UL	0.15 UL	**0.06 L**	**0.08 L**
Nickel	38.0	9.52	**10.1**	**6.6**	**10.0**	**4.8**	**3.7**	**4.1 J**	**7.0**
Selenium	0.52	0.51	**2.00 J**	**0.38 J**	**0.91 J**	3.8 U	2.6 U	4.3 U	**0.38 J**
Thallium	1.00	--	5.7 U	1.7 U	**0.18 J**	2.7 U	1.9 U	3.1 U	0.09 B
Vanadium	130	27.9	**26.6**	**19.6**	**50.0**	**22.1**	**10.3**	**18.1**	**22.5**
Zinc	120	26.5	**96.7**	**54.9**	**176**	**17.0**	**12.2 K**	**18.6 K**	**25.9 K**
Other Parameters									
Total organic carbon (MG/KG)	--	--	**120,000 J**	**7,300 J**	**6,200 J**	**27,000 J**	**22,000**	**49,000**	**30,000**
pH	--	--	**4.6**	**6.8**	**7.1**	**7.1**	**5.4**	**5.0**	**5.0**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-26

Ecological Screening Statistics - AOC 6 Ammonia Settling Pit Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Explosives (UG/KG)																			
1,3,5-Trinitrobenzene	99.0 - 100	1 / 5	41.0	41.0	CAA06-SB06-1008	48.0	3.92	51.7	47.9	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
2,4,6-Trinitrotoluene	99.0 - 100	2 / 5	100	100	CAA06-SB06-1008	69.9	27.5	96.1	65.8	10,000	0 / 5	0.01	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	5 / 5	5,140	15,900	CAA06-SB10-1108	9,864	4,404	14,063	9,069	pH < 5.5	4 / 5	--	13,000	1 / 5	1.22	**YES**	**--**	--	**NO**
Antimony	4.40 - 5.80	1 / 5	0.070	0.070	CAA06-SB06-1008	2.00	1.11	3.07	1.21	78.0	0 / 5	0.001	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	5 / 5	1.80	4.90	CAA06-SB10-1108	3.36	1.17	4.47	3.18	18.0	0 / 5	0.27	--	-- / --	--	NO	--	--	NO
Barium	-- - --	5 / 5	15.2	24.9	CAA06-SB06-1008	20.0	4.17	24.0	19.6	330	0 / 5	0.08	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	5 / 5	0.24	0.42	CAA06-SB06-1008	0.36	0.069	0.43	0.35	40.0	0 / 5	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.38 - 0.48	2 / 5	0.020	0.040	CAA06-SB06-1008	0.14	0.10	0.24	0.095	32.0	0 / 5	0.001	--	-- / --	--	NO	--	--	NO
Calcium [2]	126 - 126	4 / 5	83.0	718	CAA06-SB10-1108	219	280	486	138	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	5 / 5	5.70	25.8	CAA06-SB10-1108	12.7	7.82	20.1	11.1	64.0	0 / 5	0.40	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	5 / 5	0.99	3.50	CAA06-SB10-1108	2.06	0.96	2.97	1.88	13.0	0 / 5	0.27	--	-- / --	--	NO	--	--	NO
Copper	1.80 - 4.80	2 / 5	2.50	29.8	CAA06-SB06-1008	7.57	12.4	19.4	3.25	70.0	0 / 5	0.43	--	-- / --	--	NO	--	--	NO
Iron	-- - --	5 / 5	4,130	14,800	CAA06-SB10-1108	8,478	3,961	12,255	7,787	5 < pH > 8	2 / 5	--	32,000	0 / 5	0.46	NO	--	--	NO
Lead	-- - --	5 / 5	5.60	91.7	CAA06-SB06-1008	24.8	37.4	60.5	12.8	120	0 / 5	0.76	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	5 / 5	366	939	CAA06-SB10-1108	648	228	866	614	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	5 / 5	16.5	39.4	CAA06-SB05-1008	29.0	10.5	39.0	27.3	220	0 / 5	0.18	--	-- / --	--	NO	--	--	NO
Mercury	0.084 - 0.11	1 / 5	0.070	0.070	CAA06-SB06-1008	0.055	0.0099	0.065	0.055	0.10	0 / 5	0.70	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	5 / 5	2.80	7.60	CAA06-SB06-1008	5.36	2.03	7.30	5.02	38.0	0 / 5	0.20	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	5 / 5	218	874	CAA06-SB10-1108	456	255	699	407	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	3.00 - 3.40	3 / 5	0.42	0.48	CAA06-SB10-1108	0.91	0.64	1.51	0.74	0.52	0 / 5	0.92	--	-- / --	--	NO	--	--	NO
Sodium [2]	13.0 - 18.9	3 / 5	24.2	47.6	CAA06-SB10-1108	23.5	16.6	39.4	18.4	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	5 / 5	9.20	30.4	CAA06-SB10-1108	18.7	7.64	26.0	17.4	130	0 / 5	0.23	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	5 / 5	9.70	55.5	CAA06-SB06-1008	22.6	18.9	40.6	18.2	120	0 / 5	0.46	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	5 / 5	3,300	15,000	CAA06-SB06-1008	7,560	4,457	11,809	6,665	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	5 / 5	4.70	6.00	CAA06-SB10-1108	5.14	0.51	5.63	5.12	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-27
Exceedances - AOC 6 Ammonia Settling Pit Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA06-SO05	CAA06-SO06		CAA06-SO10	CAA06-SO11	CAA06-SO12
Sample ID			CAA06-SB05-1008	CAA06-SB06-1008	CAA06-SB06P-1008	CAA06-SB10-1108	CAA06-SB11-1108	CAA06-SB12-1108
Sample Date			10/21/08	10/21/08	10/21/08	11/06/08	11/06/08	11/06/08
Semivolatile Organic Compounds (UG/KG)								
No Detections	--	--	NA	NA	NA	NA	NA	NA
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	--	--	100 U	100 U	**41 J**	99 U	100 U	99 U
2,4,6-Trinitrotoluene	10,000	--	100 U	**100**	100 U	**100**	100 U	99 U
Inorganics (MG/KG)								
Aluminum	pH < 5.5	13,000	**9,520**	**12,400**	**7,480**	**15,900**	**5,140**	**6,360**
Antimony	78.0	--	4.4 UL	**0.07 L**	5.5 UL	4.6 UL	5.1 UL	5.8 UL
Arsenic	18.0	5.54	**2.9 J**	**3.2 J**	**2.2 J**	**4.9 L**	**1.8 L**	**4.0 L**
Barium	330	84.5	**22.4**	**24.9**	**18.5**	**16.1 K**	**15.2 K**	**21.3 K**
Beryllium	40.0	0.52	**0.38**	**0.42 J**	**0.27 J**	**0.38 J**	**0.24 J**	**0.38 J**
Cadmium	32.0	--	**0.02 J**	**0.04 J**	**0.02 J**	0.38 U	0.42 U	0.48 U
Chromium	64.0	33.7	**11.4 L**	**12.5 L**	**8.4 L**	**25.8**	**5.7**	**8.0**
Cobalt	13.0	5.18	**1.9 J**	**2.4 J**	**1.5 J**	**3.5 J**	**0.99 J**	**1.5 J**
Copper	70.0	3.17	**2.5**	**29.8 J**	**4.0 J**	4.8 B	4.5 B	1.8 B
Iron	5 < pH > 8	32,000	**7,520 J**	**9,080 J**	**5,820 J**	**14,800**	**4,130**	**6,860**
Lead	120	8.79	**7.1 J**	**91.7 J**	**18.1 J**	**9.4**	**10.2**	**5.6**
Manganese	220	176	**39.4**	**39.4**	**32.1**	**16.5 L**	**20.7 L**	**28.8 L**
Mercury	0.10	0.14	0.11 UL	**0.07 L**	0.12 UL	0.084 UL	0.11 UL	0.11 UL
Nickel	38.0	17.6	**5.7**	**7.6**	**4.1**	**6.9**	**2.8 J**	**3.8**
Selenium	0.52	0.64	**0.42 J**	**0.43 J**	**0.34 J**	**0.48 J**	3.0 U	3.4 U
Vanadium	130	48.3	**17.5**	**19.6**	**13.5**	**30.4**	**9.2**	**16.7**
Zinc	120	28.0	**15.7**	**55.5 J**	**15.1 J**	**20.9 K**	**9.7 K**	**11.3 K**
Other Parameters								
Total organic carbon (MG/KG)	--	--	**7,000 J**	**15,000 J**	NA	**3,300**	**7,300**	**5,200**
pH	--	--	**4.8**	**4.7**	NA	**6.0**	**5.1**	**5.1**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-28

Ecological Screening Statistics - AOC 6 1918 Drum Storage Area Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Inorganics (MG/KG)																			
Aluminum	-- - --	6 / 6	5,770	13,200	CAA06-SB16-1108	10,850	2,830	13,178	10,462	pH < 5.5	0 / 6	--	--	-- / --	--	NO	--	--	NO
Antimony	4.90 - 4.90	5 / 6	0.10	0.16	CAA06-SB15-1108	0.52	0.94	1.30	0.22	78.0	0 / 6	0.002	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	6 / 6	2.20	5.00	CAA06-SB15-1108	3.65	1.05	4.52	3.51	18.0	0 / 6	0.28	--	-- / --	--	NO	--	--	NO
Barium	-- - --	6 / 6	27.4	44.5	CAA06-SB14-1108	36.0	6.73	41.5	35.5	330	0 / 6	0.13	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	6 / 6	0.23	0.48	CAA06-SB15-1108	0.38	0.10	0.46	0.37	40.0	0 / 6	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.28 - 0.44	4 / 6	0.030	0.080	CAA06-SB18-1108	0.092	0.075	0.15	0.070	32.0	0 / 6	0.003	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	6 / 6	626	12,600	CAA06-SB16-1108	3,500	4,589	7,275	2,004	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	6 / 6	8.40	20.0	CAA06-SB15-1108	15.2	4.31	18.8	14.6	64.0	0 / 6	0.31	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	6 / 6	0.95	2.40	CAA06-SB15-1108	1.76	0.52	2.18	1.69	13.0	0 / 6	0.18	--	-- / --	--	NO	--	--	NO
Copper	-- - --	6 / 6	2.80	6.20	CAA06-SB19-1108	4.45	1.18	5.42	4.31	70.0	0 / 6	0.09	--	-- / --	--	NO	--	--	NO
Iron	-- - --	6 / 6	5,800	12,700	CAA06-SB15-1108	10,377	2,518	12,448	10,061	5 < pH > 8	2 / 6	--	32,000	0 / 6	0.40	NO	--	--	NO
Lead	-- - --	6 / 6	7.60	60.0	CAA06-SB15-1108	23.3	19.0	38.9	18.4	120	0 / 6	0.50	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	6 / 6	432	1,150	CAA06-SB19-1108	902	290	1,141	855	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	6 / 6	29.0	104	CAA06-SB14-1108	59.6	30.7	84.8	53.1	220	0 / 6	0.47	--	-- / --	--	NO	--	--	NO
Mercury	0.11 - 0.12	1 / 6	0.040	0.040	CAA06-SB19-1108	0.053	0.0068	0.059	0.053	0.10	0 / 6	0.40	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	6 / 6	2.80	6.70	CAA06-SB19-1108	4.88	1.52	6.13	4.67	38.0	0 / 6	0.18	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	6 / 6	342	1,030	CAA06-SB15-1108	691	283	924	637	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.70 - 3.20	1 / 6	0.33	0.33	CAA06-SB17-1108	1.29	0.48	1.68	1.15	0.52	0 / 6	0.63	--	-- / --	--	NO	--	--	NO
Sodium [2]	-- - --	6 / 6	20.5	119	CAA06-SB16-1108	46.8	36.7	77.0	38.8	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Thallium	1.40 - 2.20	1 / 6	0.080	0.080	CAA06-SB16-1108	0.81	0.39	1.13	0.63	1.00	0 / 6	0.08	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	6 / 6	11.6	25.4	CAA06-SB15-1108	20.3	4.91	24.4	19.7	130	0 / 6	0.20	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	6 / 6	9.80	51.1	CAA06-SB18-1108	23.8	14.7	35.9	20.6	120	0 / 6	0.43	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	6 / 6	1,700	20,000	CAA06-SB19-1108	8,100	7,268	14,079	5,712	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	6 / 6	6.10	8.50	CAA06-SB15-1108	7.22	0.97	8.01	7.16	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-29
Exceedances - AOC 6 1918 Drum Storage Area Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID			CAA06-SB14-1108	CAA06-SB15-1108	CAA06-SB16-1108	CAA06-SB17-1108	CAA06-SB18-1108	CAA06-SB19-1108	CAA06-SB19P-1108
Sample Date			11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Semivolatile Organic Compounds (UG/KG)									
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/KG)									
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)									
Aluminum	pH < 5.5	13,000	**9,530**	**12,700**	**13,200**	**12,700**	**5,770**	**11,200**	**11,100**
Antimony	78.0	--	**0.1 L**	**0.16 L**	**0.16 L**	**0.16 L**	4.9 UL	**0.08 L**	**0.11 L**
Arsenic	18.0	5.54	**4.1**	**5.0**	**4.2**	**2.6**	**2.2**	**3.8**	**3.4**
Barium	330	84.5	**44.5**	**37.8**	**27.4**	**32.7**	**31.1**	**42.5**	**41.9**
Beryllium	40.0	0.52	**0.45**	**0.48**	**0.35 J**	**0.31**	**0.23 J**	**0.47**	**0.42**
Cadmium	32.0	--	**0.03 J**	**0.04 J**	0.44 U	0.28 U	**0.08 J**	**0.04 J**	**0.02 J**
Chromium	64.0	33.7	**12.6**	**20.0**	**16.6**	**14.7**	**8.4**	**18.3**	**19.0**
Cobalt	13.0	5.18	**1.8 J**	**2.4 J**	**1.9 J**	**1.4 J**	**0.95 J**	**2.1 J**	**1.9 J**
Copper	70.0	3.17	**4.6**	**5.2**	**2.8**	**3.7**	**4.2**	**6.2**	**5.5**
Iron	5 < pH > 8	32,000	**9,960**	**12,700**	**11,900**	**9,900**	**5,800**	**12,000**	**11,100**
Lead	120	8.79	**19.3**	**60.0**	**9.6**	**7.6**	**20.1**	**19.8**	**22.9**
Manganese	220	176	**104**	**86.3**	**29.0**	**30.4**	**44.8**	**58.8**	**62.9**
Mercury	0.10	0.14	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	**0.04 J**	0.11 U
Nickel	38.0	17.6	**4.2**	**6.4**	**5.3**	**3.9**	**2.8 J**	**6.2**	**6.7**
Selenium	0.52	0.64	2.7 U	2.9 U	3.1 U	**0.33 J**	2.9 U	3.2 U	2.0 U
Thallium	1.00	--	1.9 U	2 U	**0.08 J**	1.4 U	2.1 U	2.2 U	1.4 U
Vanadium	130	48.3	**18.0**	**25.4**	**23.2**	**22.2**	**11.6**	**21.6**	**20.4**
Zinc	120	28.0	**21.6**	**26.9**	**12.9**	**9.8**	**51.1**	**20.6**	**19.7**
Other Parameters									
Total organic carbon (MG/KG)	--	--	**14,000**	**3,400**	**1,700**	**3,700**	**5,800**	**20,000**	NA
pH	--	--	**8.1**	**8.5**	**7.2**	**6.2**	**6.1**	**7.2**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-30

Ecological Screening Statistics - AOC 6 TNT Catch Box Ruins Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																			
2,4-Dinitrotoluene	360 - 450	2 / 7	1,600	1,700	CAA06-SB01-1008	611	711	1,133	358	11,000	0 / 7	0.15	--	-- / --	--	NO	--	--	NO
Explosives (UG/KG)																			
1,3-Dinitrobenzene	100 - 100	3 / 7	28.0	1,600	CAA06-SB01-1008	303	579	728	97.1	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
2,4,6-Trinitrotoluene	100 - 100	4 / 7	1,400	2,700,000	CAA06-SB01-1008	481,179	1,008,705	1,222,025	2,980	10,000	2 / 7	270	--	-- / --	--	**YES**	122	48.1	**YES**
2,4-Dinitrotoluene	100 - 100	2 / 7	780	12,000	CAA06-SB01-1008	1,861	4,479	5,151	162	11,000	1 / 7	1.09	--	-- / --	--	**YES**	0.47	0.17	NO
2-Amino-4,6-dinitrotoluene	99.0 - 100	3 / 7	610	15,000	CAA06-SB13-1108	2,351	5,584	6,453	233	80,000	0 / 7	0.19	--	-- / --	--	NO	--	--	NO
3,5-Dinitroaniline	99.0 - 100	1 / 7	550	550	CAA06-SB13-1108	121	189	260	70.3	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
4-Amino-2,6-dinitrotoluene	99.0 - 100	2 / 7	340	30,000	CAA06-SB13-1108	4,370	11,302	12,671	164	80,000	0 / 7	0.38	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	7 / 7	4,200	23,600	CAA06-SB03-1008	12,593	6,081	17,059	11,274	pH < 5.5	1 / 7	--	13,000	3 / 7	1.82	**YES**	mean pH > 5.5		NO
Arsenic	-- - --	7 / 7	2.00	20.9	CAA06-SB01-1008	9.01	6.62	13.9	7.03	18.0	1 / 7	1.16	5.54	4 / 7	3.77	**YES**	0.77	0.50	NO
Barium	-- - --	7 / 7	13.5	35.9	CAA06-SB03-1008	22.8	8.17	28.8	21.6	330	0 / 7	0.11	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	7 / 7	0.34	0.73	CAA06-SB01-1008	0.49	0.15	0.60	0.47	40.0	0 / 7	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.35 - 0.90	2 / 7	0.020	0.11	CAA06-SB04-1008	0.21	0.14	0.31	0.16	32.0	0 / 7	0.003	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	7 / 7	104	1,340	CAA06-SB03-1008	730	420	1,038	583	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	7 / 7	5.20	36.3	CAA06-SB03-1008	21.1	11.3	29.4	18.0	64.0	0 / 7	0.57	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	7 / 7	1.80	5.00	CAA06-SB03-1008	3.01	1.04	3.78	2.87	13.0	0 / 7	0.38	--	-- / --	--	NO	--	--	NO
Copper	1.50 - 4.80	4 / 7	3.90	8.10	CAA06-SB03-1008	3.63	2.46	5.44	2.85	70.0	0 / 7	0.12	--	-- / --	--	NO	--	--	NO
Cyanide	0.50 - 0.65	1 / 7	0.54	0.54	CAA06-SB13-1108	0.32	0.100	0.39	0.31	15.8	0 / 7	0.03	--	-- / --	--	NO	--	--	NO
Iron	-- - --	7 / 7	3,460	34,700	CAA06-SB01-1008	16,746	10,626	24,550	13,533	5 < pH > 8	0 / 7	--	--	-- / --	--	NO	--	--	NO
Lead	-- - --	7 / 7	4.10	35.4	CAA06-SB13-1108	15.4	11.3	23.6	12.1	120	0 / 7	0.30	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	7 / 7	332	1,410	CAA06-SB03-1008	796	334	1,042	735	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	7 / 7	26.5	108	CAA06-SB01-1008	44.4	28.4	65.3	39.6	220	0 / 7	0.49	--	-- / --	--	NO	--	--	NO
Mercury	0.086 - 0.14	1 / 7	0.050	0.050	CAA06-SB13-1108	0.055	0.0086	0.061	0.054	0.10	0 / 7	0.50	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	7 / 7	3.30	17.2	CAA06-SB03-1008	7.69	4.50	11.0	6.83	38.0	0 / 7	0.45	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	7 / 7	203	1,630	CAA06-SB03-1008	835	450	1,165	713	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.70 - 2.70	6 / 7	0.40	1.60	CAA06-SB03-1008	0.92	0.51	1.29	0.79	0.52	4 / 7	3.08	0.64	3 / 7	2.50	**YES**	2.49	1.76	**YES**
Sodium [2]	15.2 - 33.2	4 / 7	29.5	60.6	CAA06-SB03-1008	28.8	18.4	42.4	23.6	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Thallium	0.11 - 4.50	1 / 7	0.070	0.070	CAA06-SB04-1008	0.98	0.96	1.69	0.39	1.00	0 / 7	0.07	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	7 / 7	6.90	54.2	CAA06-SB03-1008	28.3	14.6	39.1	24.5	130	0 / 7	0.42	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	7 / 7	7.60	34.6	CAA06-SB03-1008	21.1	8.29	27.2	19.4	120	0 / 7	0.29	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	7 / 7	2,200	12,000	CAA06-SB08-1108	4,686	3,460	7,227	3,929	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	7 / 7	5.30	6.80	CAA06-SB08-1108	5.97	0.46	6.31	5.96	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-31
Exceedances - AOC 6 TNT Catch Box Ruins Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO07	CAA06-SO08	CAA06-SO13
Sample ID			CAA06-SB01-1008	CAA06-SB02-1008	CAA06-SB03-1008	CAA06-SB04-1008	CAA06-SB07-1108	CAA06-SB08-1108	CAA06-SB13-1108
Sample Date			10/20/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08
Semivolatile Organic Compounds (UG/KG)									
2,4-Dinitrotoluene	11,000	--	**1,700**	450 U	380 U	360 U	390 U	370 U	**1,600**
Explosives (UG/KG)									
1,3-Dinitrobenzene	--	--	**1,600 J**	100 UJ	**28 J**	100 U	100 U	100 U	**290**
2,4,6-Trinitrotoluene	10,000	--	**2,700,000**	**6,700**	**1,400**	100 U	100 U	100 U	**660,000**
2,4-Dinitrotoluene	11,000	--	**12,000**	100 U	100 U	100 U	100 U	100 U	**780**
2-Amino-4,6-dinitrotoluene	80,000	--	99 UJ	**610 J**	**650 J**	100 U	100 U	100 U	**15,000**
3,5-Dinitroaniline	--	--	99 U	100 U	100 U	100 U	100 U	100 UJ	**550**
4-Amino-2,6-dinitrotoluene	80,000	--	99 U	100 U	**340**	100 U	100 U	100 U	**30,000**
Inorganics (MG/KG)									
Aluminum	pH < 5.5	13,000	**10,400**	**16,200**	**23,600**	**10,400**	**4,200**	**9,950**	**13,400**
Arsenic	18.0	5.54	**20.9 J**	**9.6 J**	**14.4 J**	**6.8 J**	**2.0 L**	**4.0 L**	**5.4 L**
Barium	330	84.5	**15.3 J**	**24.5**	**35.9**	**13.5 J**	**16.4 K**	**28.8 K**	**25.4 K**
Beryllium	40.0	0.52	**0.73**	**0.40 J**	**0.67**	**0.48 J**	**0.37 J**	**0.34 J**	**0.42**
Cadmium	32.0	--	**0.02 J**	0.57 U	0.9 U	**0.11 J**	0.38 U	0.48 U	0.35 U
Chromium	64.0	33.7	**34.4 L**	**23.6 L**	**36.3 L**	**19.7 L**	**5.2**	**12.5**	**16.3**
Cobalt	13.0	5.18	**3.3 J**	**3.5 J**	**5.0 J**	**2.5 J**	**2.4 J**	**1.8 J**	**2.6 J**
Copper	70.0	3.17	**4.3**	**4.6**	**8.1**	**3.9**	1.5 B	2.7 B	4.8 B
Cyanide	15.8	2.70	0.55 U	0.65 U	0.6 U	0.55 U	0.5 U	0.55 U	**0.54 J**
Iron	5 < pH > 8	32,000	**34,700 J**	**15,400 J**	**25,700 J**	**17,800 J**	**3,460**	**8,260**	**11,900**
Lead	120	8.79	**25.0 J**	**10.8 J**	**16.6 J**	**6.9 J**	**4.1**	**8.7**	**35.4**
Manganese	220	176	**108**	**31.0**	**37.4**	**26.5**	**31.8 L**	**36.9 L**	**39.4 L**
Mercury	0.10	0.14	0.11 UL	0.14 UL	0.11 UL	0.1 UL	0.12 UL	0.086 UL	**0.05 L**
Nickel	38.0	17.6	**7.2**	**8.3**	**17.2**	**5.6**	**3.3**	**5.2**	**7.0**
Selenium	0.52	0.64	**1.4 J**	**0.64 J**	**1.6 J**	**0.62 J**	2.7 U	**0.40 J**	**0.41 J**
Thallium	1.00	--	4.2 U	2.8 U	4.5 U	**0.07 J**	1.9 U	0.12 B	0.11 B
Vanadium	130	48.3	**32.6**	**33.4**	**54.2**	**28.3**	**6.9**	**19.1**	**23.9**
Zinc	120	28.0	**24.0**	**24.7**	**34.6**	**19.7**	**7.6 K**	**16.2 K**	**20.8 K**
Other Parameters									
Total organic carbon (MG/KG)	--	--	**2,600 J**	**3,200 J**	**2,200 J**	**2,500 J**	**4,700**	**12,000**	**5,600**
pH	--	--	**6.0**	**5.7**	**6.1**	**6.1**	**5.8**	**6.8**	**5.3**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-32

Ecological Screening Statistics - AOC 6 Ammonia Settling Pit Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Inorganics (UG/L)																				
Aluminum	-- - --	3 / 3	2,860	16,800	CAA06-DW02-1108	7,840	7,776	20,949	5,703	87.0	3 / 3	193	2,230	3 / 3	7.53	**(NO)**	241	90.1	**(NO)**	**(NO)**
Arsenic	6.80 - 6.80	2 / 3	25.3	47.4	CAA06-DW02-1108	25.4	22.0	62.5	16.0	150	0 / 3	0.32	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	3 / 3	14.4	31.6	CAA06-DW04-1108	22.1	8.73	36.9	21.0	4.00	3 / 3	7.90	118	0 / 3	0.27	NO	--	--	NO	NO
Beryllium	-- - --	3 / 3	0.45	2.00	CAA06-DW02-1108	1.04	0.84	2.45	0.84	0.66	2 / 3	3.03	2.45	0 / 3	0.82	NO	--	--	NO	NO
Cadmium	-- - --	3 / 3	0.33	1.70	CAA06-DW02-1108	1.01	0.69	2.16	0.82	0.27	3 / 3	6.28	0.605	2 / 3	2.81	**(NO)**	8.00	3.73	**(NO)**	NO
Calcium [2]	-- - --	3 / 3	25,600	41,300	CAA06-DW02-1108	34,067	7,922	47,423	33,419	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	3 / 3	7.70	42.5	CAA06-DW02-1108	19.8	19.6	53.0	14.5	11.4	1 / 3	3.73	15.1	1 / 3	2.81	**(NO)**	4.65	1.74	**(NO)**	NO
Cobalt	-- - --	3 / 3	7.80	30.4	CAA06-DW04-1108	21.2	11.9	41.3	18.2	23.0	2 / 3	1.32	20.6	2 / 3	1.48	**(NO)**	1.79	0.92	NO	NO
Iron	-- - --	3 / 3	8,730	126,000	CAA06-DW02-1108	66,677	58,647	165,547	41,569	1,000	3 / 3	126	894	3 / 3	141	**(NO)**	166	66.7	**(NO)**	**(NO)**
Lead	-- - --	3 / 3	4.40	22.3	CAA06-DW02-1108	10.8	10.0	27.6	8.19	3.18	3 / 3	7.01	21.3	1 / 3	1.05	**(NO)**	8.69	3.38	**(NO)**	NO
Magnesium [2]	-- - --	3 / 3	4,060	6,720	CAA06-DW04-1108	5,517	1,348	7,789	5,400	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	3 / 3	320	3,000	CAA06-DW04-1108	1,463	1,383	3,794	1,009	120	3 / 3	25.0	57.9	3 / 3	51.8	**(NO)**	31.6	12.2	**(NO)**	**(NO)**
Mercury	0.20 - 0.20	1 / 3	0.040	0.040	CAA06-DW02-1108	0.080	0.035	0.14	0.074	0.91	0 / 3	0.04	--	-- / --	--	NO	--	--	NO	NO
Nickel	-- - --	3 / 3	11.6	53.8	CAA06-DW02-1108	26.6	23.6	66.4	20.8	52.2	1 / 3	1.03	11.4	3 / 3	4.72	**(NO)**	1.27	0.51	NO	NO
Potassium [2]	-- - --	3 / 3	1,320	4,610	CAA06-DW02-1108	2,667	1,724	5,573	2,327	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	3 / 3	11,100	17,200	CAA06-DW04-1108	13,233	3,439	19,030	12,959	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	3 / 3	5.10	52.3	CAA06-DW02-1108	22.6	25.9	66.2	14.0	20.0	1 / 3	2.62	26.2	1 / 3	2.00	**(NO)**	3.31	1.13	**(NO)**	NO
Zinc	-- - --	3 / 3	27.4	160	CAA06-DW02-1108	78.6	71.3	199	59.6	120	1 / 3	1.34	4.52	3 / 3	35.4	**(NO)**	1.66	0.66	NO	NO
Dissolved Metals (UG/L)																				
Arsenic	-- - --	3 / 3	2.90	18.4	CAA06-DW03-1108	12.9	8.70	27.6	9.77	150	0 / 3	0.12	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	3 / 3	4.00	25.9	CAA06-DW04-1108	11.4	12.6	32.6	7.58	4.00	3 / 3	6.48	127	0 / 3	0.20	NO	--	--	NO	NO
Calcium [2]	-- - --	3 / 3	28,400	41,800	CAA06-DW02-1108	34,633	6,749	46,010	34,201	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Cobalt	50.0 - 50.0	2 / 3	5.70	25.2	CAA06-DW04-1108	18.6	11.2	37.5	15.3	23.0	1 / 3	1.10	0.70	2 / 3	36.0	**YES**	1.63	0.81	NO	NO
Iron	-- - --	3 / 3	1,100	51,400	CAA06-DW03-1108	31,667	26,843	76,920	13,394	1,000	3 / 3	51.4	275	3 / 3	187	**YES**	76.9	31.7	**YES**	**YES**
Lead	-- - --	3 / 3	1.30	1.70	CAA06-DW02-1108	1.47	0.21	1.82	1.46	2.52	0 / 3	0.68	--	-- / --	--	NO	--	--	NO	NO
Magnesium [2]	-- - --	3 / 3	3,460	7,070	CAA06-DW04-1108	4,890	1,918	8,124	4,661	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	3 / 3	249	3,170	CAA06-DW04-1108	1,467	1,520	4,029	919	120	3 / 3	26.4	49.5	3 / 3	64.0	**YES**	33.6	12.2	**YES**	**YES**
Nickel	40.0 - 40.0	2 / 3	7.50	7.60	CAA06-DW02-1108	11.7	7.19	23.8	10.4	52.0	0 / 3	0.15	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	3 / 3	1,140	2,220	CAA06-DW02-1108	1,567	575	2,535	1,502	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	3 / 3	11,200	18,500	CAA06-DW04-1108	13,667	4,186	20,724	13,279	NSV	-- / --	NSV	--	-- / --	--	NO	--	--	NO	NO
Vanadium	50.0 - 50.0	1 / 3	0.53	0.53	CAA06-DW03-1108	16.8	14.1	40.7	6.92	20.0	0 / 3	0.03	--	-- / --	--	NO	--	--	NO	NO
Zinc	2.20 - 2.20	2 / 3	13.4	15.4	CAA06-DW02-1108	9.97	7.74	23.0	6.10	118	0 / 3	0.13	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-33
Exceedances - AOC 6 Ammonia Settling Pit Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	**95% UTL Yorktown-Eastover**	CAA06-DW02	CAA06-DW03	CAA06-DW04	
Sample ID			CAA06-DW02-1108	CAA06-DW03-1108	CAA06-DW04-1108	CAA06-DW04P-1108
Sample Date			11/06/08	11/06/08	11/06/08	11/06/08
Semivolatile Organic Compounds (UG/L)						
No Detections	--	--	NA	NA	NA	NA
Explosives (UG/L)						
No Detections	--	--	NA	NA	NA	NA
Inorganics (UG/L)						
Aluminum	87.0	2,230	**16,800**	**3,860**	**1,980**	**2,860**
Arsenic	150	2.28	**47.4**	**25.3**	4.8 B	6.8 B
Barium	4.00	118	**20.4 J**	**14.4 J**	**29.5 J**	**31.6 J**
Beryllium	0.66	2.45	**2.0 J**	**0.66 J**	**0.24 J**	**0.45 J**
Cadmium	0.271	0.605	**1.7 J**	**1.0 J**	0.34 B	**0.33 J**
Chromium	11.4	15.1	**42.5**	**9.3 J**	**5.8 J**	**7.7 J**
Cobalt	23.0	20.6	**25.5 J**	**7.8 J**	**28.1 J**	**30.4 J**
Iron	1,000	894	**126,000**	**65,300**	**6,180**	**8,730**
Lead	3.18	21.3	**22.3**	**5.6 J**	**3.6 J**	**4.4 J**
Manganese	120	57.9	**1,070**	**320**	**3,000**	**2,970**
Mercury	0.91	0.081	**0.04 J**	0.2 U	0.2 U	0.2 U
Nickel	52.2	11.4	**53.8**	**11.6 J**	**12.1 J**	**14.4 J**
Vanadium	20.0	26.2	**52.3**	**10.3 J**	**3.7 J**	**5.1 J**
Zinc	120	4.52	**160**	**48.4 J**	**20.0 J**	**27.4 J**
Dissolved Metals (UG/L)						
Arsenic	150	1.37	**17.5**	**18.4**	**2.9 J**	10 U
Barium	4.00	127	**4.2 J**	**4.0 J**	**25.9 J**	**22.8 J**
Cobalt	23.0	0.70	**5.7 J**	50 U	**22.8 J**	**25.2 J**
Iron	1,000	275	**42,500**	**51,400**	**846**	**1,100**
Lead	2.52	1.70	**1.7 J**	**1.4 J**	**1.3 J**	10 U
Manganese	120	49.5	**983**	**249**	**3,150**	**3,170**
Nickel	52.0	12.2	**7.6 J**	40 U	**6.2 J**	**7.5 J**
Vanadium	20.0	4.30	50 U	**0.53 J**	50 U	50 U
Zinc	118	--	**15.4 J**	2.2 B	**4.7 J**	**13.4 J**

Notes:
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
Equals or exceeds Background UTL

TABLE B-34

Ecological Screening Statistics - AOC 6 1918 Drum Storage Area Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Inorganics (UG/L)																				
Aluminum	-- - --	3 / 3	12,100	57,600	CAA06-DW09-1108	28,100	25,578	71,221	21,670	87.0	3 / 3	662	2,230	3 / 3	25.8	**(NO)**	819	323	**(NO)**	**(NO)**
Antimony	-- - --	3 / 3	3.60	8.80	CAA06-DW09-1108	5.40	2.95	10.4	4.94	30.0	0 / 3	0.29	--	-- / --	--	NO	--	--	NO	NO
Arsenic	-- - --	3 / 3	24.6	134	CAA06-DW09-1108	70.6	56.8	166	55.9	150	0 / 3	0.89	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	3 / 3	68.5	208	CAA06-DW09-1108	121	75.7	249	107	4.00	3 / 3	52.0	118	1 / 3	1.76	**(NO)**	62.2	30.3	**(NO)**	NO
Beryllium	-- - --	3 / 3	0.80	4.10	CAA06-DW09-1108	1.97	1.85	5.09	1.49	0.66	3 / 3	6.21	2.45	1 / 3	1.67	**(NO)**	7.71	2.98	**(NO)**	NO
Cadmium	-- - --	3 / 3	0.57	5.00	CAA06-DW09-1108	2.32	2.35	6.29	1.59	0.27	3 / 3	18.5	0.605	2 / 3	8.26	**(NO)**	23.3	8.59	**(NO)**	NO
Calcium [2]	-- - --	3 / 3	278,000	661,000	CAA06-DW09-1108	432,000	202,215	772,905	403,309	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	3 / 3	59.0	250	CAA06-DW09-1108	131	104	306	108	11.4	3 / 3	21.9	15.1	3 / 3	16.6	**(NO)**	26.8	11.5	**(NO)**	**(NO)**
Cobalt	-- - --	3 / 3	6.00	23.3	CAA06-DW09-1108	12.1	9.71	28.5	9.93	23.0	1 / 3	1.01	20.6	1 / 3	1.13	**(NO)**	1.24	0.53	NO	NO
Copper	-- - --	3 / 3	23.1	60.2	CAA06-DW09-1108	36.4	20.6	71.2	33.1	9.33	3 / 3	6.45	12.2	3 / 3	4.93	**(NO)**	7.63	3.91	**(NO)**	NO
Iron	-- - --	3 / 3	27,800	116,000	CAA06-DW09-1108	58,633	49,727	142,467	46,954	1,000	3 / 3	116	894	3 / 3	130	**(NO)**	142	58.6	**(NO)**	**(NO)**
Lead	-- - --	3 / 3	11.9	50.1	CAA06-DW09-1108	25.5	21.3	61.5	20.6	3.18	3 / 3	15.7	21.3	1 / 3	2.35	**(NO)**	19.3	8.03	**(NO)**	NO
Magnesium [2]	-- - --	3 / 3	5,510	20,700	CAA06-DW09-1108	10,993	8,430	25,205	9,174	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	3 / 3	109	424	CAA06-DW09-1108	219	178	519	178	120	2 / 3	3.53	57.9	3 / 3	7.32	**(NO)**	4.32	1.82	**(NO)**	NO
Mercury	0.20 - 0.20	1 / 3	0.040	0.040	CAA06-DW09-1108	0.080	0.035	0.14	0.074	0.91	0 / 3	0.04	--	-- / --	--	NO	--	--	NO	NO
Nickel	-- - --	3 / 3	26.5	86.7	CAA06-DW09-1108	52.4	31.0	105	46.5	52.2	1 / 3	1.66	11.4	3 / 3	7.61	**(NO)**	2.01	1.00	**(NO)**	NO
Potassium [2]	-- - --	3 / 3	5,660	23,000	CAA06-DW09-1108	12,627	9,158	28,066	10,627	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Selenium	35.0 - 35.0	2 / 3	5.50	5.80	CAA06-DW09-1108	9.60	6.84	21.1	8.23	5.00	2 / 3	1.16	--	-- / --	--	**(NO)**	4.23	1.92	**(NO)**	NO
Sodium [2]	-- - --	3 / 3	7,330	24,200	CAA06-DW09-1108	15,243	8,483	29,545	13,606	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Thallium	-- - --	3 / 3	1.70	2.20	CAA06-DW11-1108	2.00	0.26	2.45	1.99	12.0	0 / 3	0.18	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	3 / 3	52.0	325	CAA06-DW09-1108	154	149	405	113	20.0	3 / 3	16.3	26.2	3 / 3	12.4	**(NO)**	20.3	7.71	**(NO)**	NO
Zinc	-- - --	3 / 3	60.2	227	CAA06-DW09-1108	116	96.2	278	94.0	120	1 / 3	1.89	4.52	3 / 3	50.2	**(NO)**	2.32	0.97	NO	NO
Dissolved Metals (UG/L)																				
Aluminum	-- - --	3 / 3	242	385	CAA06-DW09-1108	292	80.4	428	286	87.0	3 / 3	4.43	100	3 / 3	3.85	**YES**	4.92	3.36	**YES**	NO
Barium	-- - --	3 / 3	31.1	50.0	CAA06-DW09-1108	42.5	10.1	59.5	41.7	4.00	3 / 3	12.5	127	0 / 3	0.39	NO	--	--	NO	NO
Calcium [2]	-- - --	3 / 3	142,000	192,000	CAA06-DW09-1108	166,667	25,007	208,824	165,412	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	0.58 - 10.0	1 / 3	0.95	0.95	CAA06-DW09-1108	2.08	2.55	6.38	1.11	11.0	0 / 3	0.09	--	-- / --	--	NO	--	--	NO	NO
Copper	-- - --	3 / 3	1.20	1.40	CAA06-DW10-1108	1.30	0.100	1.47	1.30	8.96	0 / 3	0.16	--	-- / --	--	NO	--	--	NO	NO
Iron	39.6 - 39.6	2 / 3	336	502	CAA06-DW11-1108	286	245	699	149	1,000	0 / 3	0.50	--	-- / --	--	NO	--	--	NO	NO
Lead	-- - --	3 / 3	1.30	2.40	CAA06-DW10-1108	1.97	0.59	2.95	1.90	2.52	0 / 3	0.95	--	-- / --	--	NO	--	--	NO	NO
Magnesium [2]	-- - --	3 / 3	1,580	3,010	CAA06-DW09-1108	2,350	721	3,566	2,270	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	3 / 3	17.7	30.5	CAA06-DW09-1108	24.1	6.40	34.9	23.5	120	0 / 3	0.25	--	-- / --	--	NO	--	--	NO	NO
Nickel	-- - --	3 / 3	6.10	7.10	CAA06-DW09-1108	6.43	0.58	7.41	6.42	52.0	0 / 3	0.14	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	3 / 3	912	3,780	CAA06-DW10-1108	2,547	1,476	5,035	2,167	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	3 / 3	5,860	21,600	CAA06-DW09-1108	13,587	7,874	26,861	11,896	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Thallium	25.0 - 25.0	1 / 3	2.00	2.00	CAA06-DW09-1108	9.00	6.06	19.2	6.79	12.0	0 / 3	0.17	--	-- / --	--	NO	--	--	NO	NO
Vanadium	50.0 - 50.0	1 / 3	0.90	0.90	CAA06-DW09-1108	17.0	13.9	40.4	8.25	20.0	0 / 3	0.05	--	-- / --	--	NO	--	--	NO	NO
Zinc	-- - --	3 / 3	3.00	4.00	CAA06-DW11-1108	3.40	0.53	4.29	3.37	118	0 / 3	0.03	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-35

Exceedances - AOC 6 1918 Drum Storage Area Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	**95% UTL Yorktown-Eastover**	CAA06-DW09	CAA06-DW10		CAA06-DW11
Sample ID			CAA06-DW09-1108	CAA06-DW10-1108	CAA06-DW10P-1108	CAA06-DW11-1108
Sample Date			11/11/08	11/11/08	11/11/08	11/11/08
Semivolatile Organic Compounds (UG/L)						
No Detections	--	--	NA	NA	NA	NA
Explosives (UG/L)						
No Detections	--	--	NA	NA	NA	NA
Inorganics (UG/L)						
Aluminum	87.0	2,230	**57,600**	**14,600 J**	**1,810 J**	**12,100**
Antimony	30.0	18.8	**8.8 J**	**3.8 J**	60 U	**3.6 J**
Arsenic	150	2.28	**134**	**53.1 J**	**11.4 J**	**24.6**
Barium	4.00	118	**208**	**87.1 J**	**48.7 J**	**68.5 J**
Beryllium	0.66	2.45	**4.1 J**	**1.0 J**	**0.18 J**	**0.8 J**
Cadmium	0.271	0.605	**5.0**	**1.4 J**	**0.18 J**	**0.57 J**
Chromium	11.4	15.1	**250**	**59.0**	**7.2 J**	**84.8**
Cobalt	23.0	20.6	**23.3 J**	**7.0 J**	**1.0 J**	**6.0 J**
Copper	9.33	12.2	**60.2**	**23.1 J**	**9.8 J**	**26.0**
Iron	1,000	894	**116,000**	**32,100 J**	**5,090 J**	**27,800**
Lead	3.18	21.3	**50.1**	**14.6**	**2.5 J**	**11.9**
Manganese	120	57.9	**424**	**109 J**	**23.5 J**	**123**
Mercury	0.91	0.081	**0.04 L**	0.2 UL	0.2 UL	0.2 UL
Nickel	52.2	11.4	**86.7**	**26.5 J**	**4.7 J**	**43.9**
Selenium	5.00	--	**5.8 J**	**5.5 J**	35 U	35 U
Thallium	12.0	--	**2.1 J**	25 U	**1.7 J**	**2.2 J**
Vanadium	20.0	26.2	**325**	**85.5**	**9.6 J**	**52.0**
Zinc	120	4.52	**227**	**60.7**	**10.3 J**	**60.2**
Dissolved Metals (UG/L)						
Aluminum	87.0	100	**385**	**227**	**242**	**250**
Barium	4.00	127	**50.0 J**	**46.5 J**	**46.4 J**	**31.1 J**
Chromium	11.0	6.04	**0.95 J**	10 U	10 U	0.58 B
Copper	8.96	3.00	**1.3 J**	**1.4 J**	**1.2 J**	**1.2 J**
Iron	1,000	275	**336**	39.6 B	18.2 B	**502**
Lead	2.52	1.70	**2.2 J**	**2.4 J**	**1.2 J**	**1.3 J**
Manganese	120	49.5	**30.5**	**23.3**	**24.1**	**17.7**
Nickel	52.0	12.2	**7.1 J**	**5.8 J**	**6.1 J**	**6.1 J**
Thallium	12.0	--	**2.0 J**	25 U	25 U	25 U
Vanadium	20.0	4.30	**0.9 J**	50 U	50 U	50 U
Zinc	118	--	**3.2 J**	**3.0 J**	**2.9 J**	**4.0 J**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-36

Ecological Screening Statistics - AOC 6 TNT Catch Box Ruins Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Inorganics (UG/L)																				
Aluminum	-- - --	4 / 4	1,730	35,100	CAA06-DW07-1108	17,400	17,935	38,504	7,969	87.0	4 / 4	403	2,230	2 / 4	15.7	**(NO)**	443	200	**(NO)**	**(NO)**
Antimony	60.0 - 60.0	1 / 3	0.78	0.78	CAA06-DW07-1108	20.3	16.9	48.7	8.89	30.0	0 / 3	0.03	--	-- / --	--	NO	--	--	NO	NO
Arsenic	-- - --	4 / 4	36.5	163	CAA06-DW07-1108	89.7	53.0	152	78.4	150	1 / 4	1.09	2.28	4 / 4	71.5	**(NO)**	1.01	0.60	NO	NO
Barium	-- - --	4 / 4	13.0	89.1	CAA06-DW07-1108	43.1	34.6	83.8	32.9	4.00	4 / 4	22.3	118	0 / 4	0.76	NO	--	--	NO	NO
Beryllium	5.00 - 5.00	3 / 4	0.29	4.80	CAA06-DW07-1108	2.57	1.84	4.74	1.75	0.66	2 / 4	7.27	2.45	2 / 4	1.96	**(NO)**	7.18	3.90	**(NO)**	NO
Calcium [2]	-- - --	4 / 4	39,400	56,100	CAA06-DW07-1108	46,875	6,923	55,021	46,501	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	8.60 - 8.60	3 / 4	5.00	152	CAA06-DW07-1108	77.6	84.2	177	26.4	11.4	2 / 4	13.3	15.1	2 / 4	10.1	**(NO)**	15.5	6.80	**(NO)**	NO
Cobalt	-- - --	4 / 4	0.53	22.2	CAA06-DW07-1108	10.6	9.43	21.7	5.58	23.0	0 / 4	0.97	--	-- / --	--	NO	--	--	NO	NO
Copper	7.40 - 7.40	3 / 4	6.00	44.4	CAA06-DW06-1108	24.4	22.6	50.9	14.4	9.33	2 / 4	4.76	12.2	2 / 4	3.64	**(NO)**	5.46	2.61	**(NO)**	NO
Iron	-- - --	4 / 4	24,800	230,000	CAA06-DW07-1108	103,700	95,799	216,425	70,308	1,000	4 / 4	230	894	4 / 4	257	**(NO)**	216	104	**(NO)**	**(NO)**
Lead	4.70 - 4.70	3 / 4	3.30	71.8	CAA06-DW07-1108	36.9	39.4	83.2	14.1	3.18	3 / 4	22.6	21.3	2 / 4	3.37	**(NO)**	26.2	11.6	**(NO)**	**(NO)**
Magnesium [2]	-- - --	4 / 4	2,870	7,260	CAA06-DW07-1108	4,708	2,192	7,286	4,325	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	239	701	CAA06-DW07-1108	441	195	671	410	120	4 / 4	5.84	57.9	4 / 4	12.1	**(NO)**	5.59	3.68	**(NO)**	NO
Mercury	0.20 - 0.20	2 / 4	0.030	0.040	CAA06-DW07-1108	0.068	0.038	0.11	0.059	0.91	0 / 4	0.04	--	-- / --	--	NO	--	--	NO	NO
Nickel	3.40 - 5.30	2 / 4	61.6	62.5	CAA06-DW07-1108	32.1	34.6	72.8	11.5	52.2	2 / 4	1.20	11.4	2 / 4	5.48	**(NO)**	1.40	0.62	NO	NO
Potassium [2]	-- - --	4 / 4	2,930	9,130	CAA06-DW07-1108	5,813	3,223	9,605	5,107	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Selenium	35.0 - 35.0	1 / 4	2.10	2.10	CAA06-DW07-1108	13.7	7.70	22.7	10.3	5.00	0 / 4	0.42	--	-- / --	--	NO	--	--	NO	NO
Silver	0.40 - 0.40	3 / 4	0.77	5.00	CAA06-DW07-1108	2.04	2.14	4.56	1.14	0.36	3 / 4	13.9	--	-- / --	--	**(NO)**	12.7	5.67	**(NO)**	NO
Sodium [2]	-- - --	4 / 4	10,600	11,700	CAA06-DW08-1108	11,175	450	11,705	11,168	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	4 / 4	3.60	155	CAA06-DW07-1108	68.4	74.9	157	26.4	20.0	2 / 4	7.75	26.2	2 / 4	5.92	**(NO)**	7.83	3.42	**(NO)**	NO
Zinc	15.1 - 15.1	3 / 4	8.90	205	CAA06-DW06-1108	104	111	234	40.4	120	2 / 4	1.71	4.52	2 / 4	45.4	**(NO)**	1.95	0.87	NO	NO
Dissolved Metals (UG/L)																				
Aluminum	68.5 - 71.4	2 / 4	127	4,080	CAA06-DW07-1108	1,069	2,008	3,432	159	87.0	2 / 4	46.9	100	2 / 4	40.8	**YES**	39.4	12.3	**YES**	**YES**
Arsenic	-- - --	4 / 4	35.4	74.6	CAA06-DW01-1108	52.7	18.9	74.9	50.1	150	0 / 4	0.50	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	8.20	27.4	CAA06-DW07-1108	15.3	8.75	25.6	13.7	4.00	4 / 4	6.85	127	0 / 4	0.22	NO	--	--	NO	NO
Beryllium	5.00 - 5.00	1 / 4	0.63	0.63	CAA06-DW07-1108	2.03	0.94	3.13	1.77	0.66	0 / 4	0.95	--	-- / --	--	NO	--	--	NO	NO
Calcium [2]	-- - --	4 / 4	40,600	54,100	CAA06-DW07-1108	47,575	5,590	54,153	47,325	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	10.0 - 10.0	1 / 4	17.1	17.1	CAA06-DW07-1108	8.03	6.05	15.1	6.80	11.0	1 / 4	1.55	6.04	1 / 4	2.83	**YES**	1.38	0.73	NO	NO
Cobalt	50.0 - 50.0	3 / 4	0.97	2.40	CAA06-DW07-1108	7.54	11.7	21.3	3.20	23.0	0 / 4	0.10	--	-- / --	--	NO	--	--	NO	NO
Copper	25.0 - 25.0	1 / 4	9.90	9.90	CAA06-DW07-1108	11.9	1.30	13.4	11.8	8.96	1 / 4	1.11	3.00	1 / 4	3.30	**YES**	1.49	1.32	**YES**	NO
Iron	-- - --	4 / 4	19,500	46,500	CAA06-DW07-1108	28,625	12,162	42,935	27,007	1,000	4 / 4	46.5	275	4 / 4	169	**YES**	42.9	28.6	**YES**	**YES**
Lead	10.0 - 10.0	2 / 4	1.00	9.80	CAA06-DW07-1108	5.20	3.60	9.44	3.96	2.52	1 / 4	3.89	1.70	1 / 4	5.76	**YES**	3.75	2.07	**YES**	NO
Magnesium [2]	-- - --	4 / 4	2,290	3,480	CAA06-DW07-1108	2,840	489	3,415	2,809	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	237	480	CAA06-DW07-1108	361	131	514	342	120	4 / 4	4.00	49.5	4 / 4	9.70	**YES**	4.29	3.01	**YES**	NO
Nickel	1.10 - 2.40	2 / 4	4.30	8.50	CAA06-DW07-1108	3.64	3.63	7.91	2.22	52.0	0 / 4	0.16	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	4 / 4	2,690	3,920	CAA06-DW07-1108	3,120	552	3,770	3,086	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Silver	0.60 - 0.60	3 / 4	0.76	1.20	CAA06-DW07-1108	0.77	0.37	1.20	0.68	0.36	3 / 4	3.33	--	-- / --	--	**YES**	3.33	2.13	**YES**	NO
Sodium [2]	-- - --	4 / 4	11,100	12,200	CAA06-DW08-1108	11,475	499	12,062	11,467	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Thallium	1.80 - 25.0	1 / 4	1.70	1.70	CAA06-DW07-1108	6.90	6.47	14.5	3.93	12.0	0 / 4	0.14	--	-- / --	--	NO	--	--	NO	NO
Vanadium	50.0 - 50.0	1 / 4	17.2	17.2	CAA06-DW07-1108	23.1	3.90	27.6	22.8	20.0	0 / 4	0.86	--	-- / --	--	NO	--	--	NO	NO
Zinc	5.00 - 5.00	3 / 4	5.10	26.2	CAA06-DW07-1108	9.95	10.9	22.8	6.69	118	0 / 4	0.22	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-37
Exceedances - AOC 6 TNT Catch Box Ruins Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	**95% UTL Yorktown-Eastover**	CAA06-DW01	CAA06-DW06	CAA06-DW07	CAA06-DW08
Sample ID			CAA06-DW01-1108	CAA06-DW06-1108	CAA06-DW07-1108	CAA06-DW08-1108
Sample Date			11/05/08	11/10/08	11/10/08	11/10/08
Semivolatile Organic Compounds (UG/L)						
No Detections	--	--	NA	NA	NA	NA
Explosives (UG/L)						
No Detections	--	--	NA	NA	NA	NA
Inorganics (UG/L)						
Aluminum	87.0	2,230	**2,170**	**30,600**	**35,100**	**1,730**
Antimony	30.0	18.8	60 R	60 U	**0.78 J**	60 U
Arsenic	150	2.28	**76.2**	**83.2**	**163**	**36.5**
Barium	4.00	118	**20.2 J**	**50.0 J**	**89.1 J**	**13.0 J**
Beryllium	0.66	2.45	**0.29 J**	**2.7 J**	**4.8 J**	5.0 U
Chromium	11.4	15.1	8.6 B	**149**	**152**	**5.0 J**
Cobalt	23.0	20.6	**6.0 J**	**13.7 J**	**22.2 J**	**0.53 J**
Copper	9.33	12.2	7.4 B	**44.4**	**43.4**	**6.0 J**
Iron	1,000	894	**34,000**	**126,000**	**230,000**	**24,800**
Lead	3.18	21.3	4.7 B	**70.2**	**71.8**	**3.3 J**
Manganese	120	57.9	**239**	**368**	**701**	**457**
Mercury	0.91	0.081	0.2 U	**0.03 J**	**0.04 J**	0.2 U
Nickel	52.2	11.4	5.3 B	**61.6**	**62.5**	3.4 B
Selenium	5.00	--	35 U	35 U	**2.1 J**	35 U
Silver	0.36	--	0.4 B	**2.2 J**	**5 J**	**0.77 J**
Vanadium	20.0	26.2	**8.1 J**	**107**	**155**	**3.6 J**
Zinc	120	4.52	15.1 B	**205**	**194**	**8.9 J**
Dissolved Metals (UG/L)						
Aluminum	87.0	100	**127 J**	68.5 B	**4,080**	71.4 B
Arsenic	150	1.37	**74.6**	**38.5**	**62.2**	**35.4**
Barium	4.00	127	**16.1 J**	**8.2 J**	**27.4 J**	**9.6 J**
Beryllium	0.66	--	5 U	5 U	**0.63 J**	5 U
Chromium	11.0	6.04	10 U	10 U	**17.1**	10 U
Cobalt	23.0	0.70	**1.8 J**	**0.97 J**	**2.4 J**	50 U
Copper	8.96	3.00	25 U	25 U	**9.9 J**	25 U
Iron	1,000	275	**25,400**	**19,500**	**46,500**	**23,100**
Lead	2.52	1.70	**1.0 J**	10 U	**9.8 J**	10 U
Manganese	120	49.5	**237**	**259**	**480**	**467**
Nickel	52.0	12.2	2.4 B	**4.3 J**	**8.5 J**	1.1 B
Silver	0.36	--	0.6 B	**0.76 J**	**1.2 J**	**0.8 J**
Thallium	12.0	--	1.8 B	25 U	**1.7 J**	25 U
Vanadium	20.0	4.30	50 U	50 U	**17.2 J**	50 U
Zinc	118	--	5 B	**6 J**	**26.2 J**	**5.1 J**

Notes:
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
NA - Not analyzed
Equals or exceeds Background UTL

TABLE B-38

Ecological Screening Statistics - AOC 6 Surface Water

WPNSTA Cheatham Annex

Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/L)																
Di-n-octylphthalate	10.0 - 10.0	1 / 2	2.20	2.20	CAA06-SW02-1008	3.60	1.98	12.4	3.32	22.0	0 / 2	0.10	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	1 / 2	2.10	2.10	CAA06-SW01-1008	3.55	2.05	12.7	3.24	32.0	0 / 2	0.07	NO	--	--	NO
Explosives (UG/L)																
RDX	0.40 - 0.40	1 / 2	0.16	0.16	CAA06-SW01-1008	0.18	0.028	0.31	0.18	186	0 / 2	0.001	NO	--	--	NO
Inorganics (UG/L)																
Barium	-- - --	2 / 2	19.6	19.8	CAA06-SW02-1008	19.7	0.14	20.3	19.7	4.00	2 / 2	4.95	**(NO)**	5.08	4.93	**(NO)**
Calcium [2]	-- - --	2 / 2	30,800	31,500	CAA06-SW02-1008	31,150	495	33,360	31,148	NSV	-- / --	--	NO	--	--	NO
Iron	-- - --	2 / 2	241	279	CAA06-SW02-1008	260	26.9	380	259	1,000	0 / 2	0.28	NO	--	--	NO
Magnesium [2]	-- - --	2 / 2	1,870	1,900	CAA06-SW02-1008	1,885	21.2	1,980	1,885	NSV	-- / --	--	NO	--	--	NO
Manganese	-- - --	2 / 2	37.4	38.6	CAA06-SW02-1008	38.0	0.85	41.8	38.0	120	0 / 2	0.32	NO	--	--	NO
Potassium [2]	-- - --	2 / 2	2,880	2,990	CAA06-SW02-1008	2,935	77.8	3,282	2,934	NSV	-- / --	--	NO	--	--	NO
Sodium [2]	-- - --	2 / 2	11,700	11,900	CAA06-SW02-1008	11,800	141	12,431	11,800	NSV	-- / --	--	NO	--	--	NO
Thallium	25.0 - 25.0	1 / 2	1.70	1.70	CAA06-SW01-1008	7.10	7.64	41.2	4.61	12.0	0 / 2	0.14	NO	--	--	NO
Vanadium	50.0 - 50.0	1 / 2	0.41	0.41	CAA06-SW02-1008	12.7	17.4	90.3	3.20	20.0	0 / 2	0.02	NO	--	--	NO
Zinc	-- - --	2 / 2	3.40	3.40	CAA06-SW01-1008	3.40	0.0	3.40	3.40	105	0 / 2	0.03	NO	--	--	NO
Dissolved Metals (UG/L)																
Aluminum	-- - --	2 / 2	52.8	55.4	CAA06-SW01-1008	54.1	1.84	62.3	54.1	87.0	0 / 2	0.64	NO	--	--	NO
Barium	-- - --	2 / 2	15.9	17.8	CAA06-SW01-1008	16.9	1.34	22.8	16.8	4.00	2 / 2	4.45	**YES**	5.71	4.21	**NO**
Calcium [2]	-- - --	2 / 2	29,700	30,700	CAA06-SW01-1008	30,200	707	33,357	30,196	NSV	-- / --	--	NO	--	--	NO
Copper	25.0 - 25.0	1 / 2	0.78	0.78	CAA06-SW02-1008	6.64	8.29	43.6	3.12	7.83	0 / 2	0.10	NO	--	--	NO
Iron	-- - --	2 / 2	34.3	35.4	CAA06-SW01-1008	34.9	0.78	38.3	34.8	1,000	0 / 2	0.04	NO	--	--	NO
Magnesium [2]	-- - --	2 / 2	1,760	1,850	CAA06-SW01-1008	1,805	63.6	2,089	1,804	NSV	-- / --	--	NO	--	--	NO
Nickel	-- - --	2 / 2	0.45	0.60	CAA06-SW01-1008	0.53	0.11	1.00	0.52	45.6	0 / 2	0.01	NO	--	--	NO
Potassium [2]	-- - --	2 / 2	2,700	2,800	CAA06-SW01-1008	2,750	70.7	3,066	2,750	NSV	-- / --	--	NO	--	--	NO
Sodium [2]	-- - --	2 / 2	11,700	11,800	CAA06-SW01-1008	11,750	70.7	12,066	11,750	NSV	-- / --	--	NO	--	--	NO
Vanadium	-- - --	2 / 2	0.41	0.46	CAA06-SW01-1008	0.44	0.035	0.59	0.43	20.0	0 / 2	0.02	NO	--	--	NO
Zinc	-- - --	2 / 2	2.40	2.90	CAA06-SW01-1008	2.65	0.35	4.23	2.64	103	0 / 2	0.03	NO	--	--	NO
Other Parameters (MG/L)																
Hardness	-- - --	2 / 2	84.6	86.4	CAA06-SW02-1008	85.5	1.27	91.2	85.5	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-39
Exceedances - AOC 6 Surface Water
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	CAA06-SW01		CAA06-SW02
Sample ID		CAA06-SW01-1008	CAA06-SW01P-1008	CAA06-SW02-1008
Sample Date		10/23/08	10/23/08	10/23/08
Semivolatile Organic Compounds (UG/L)				
Di-n-octylphthalate	22.0	10 U	10 U	**2.2 J**
bis(2-Ethylhexyl)phthalate	32.0	**2.1 J**	10 U	10 U
Explosives (UG/L)				
RDX	186	**0.16 J**	0.4 U	0.4 U
Inorganics (UG/L)				
Barium	4.00	**19.6 J**	**19 J**	**19.8 J**
Iron	1,000	**240**	**241**	**279**
Manganese	120	**37.4**	**37.1**	**38.6**
Thallium	12.0	**1.7 J**	25 U	25 U
Vanadium	20.0	50 U	50 U	**0.41 J**
Zinc	105	**3.4 J**	**3 J**	**3.4 J**
Dissolved Metals (UG/L)				
Aluminum	87.0	**55.4 J**	**36 J**	**52.8 J**
Barium	4.00	**17.5 J**	**17.8 J**	**15.9 J**
Copper	7.83	25 U	25 U	**0.78 J**
Iron	1,000	**35.4 J**	**31.8 J**	**34.3 J**
Nickel	45.6	**0.52 J**	**0.6 J**	**0.45 J**
Vanadium	20.0	50 U	**0.46 J**	**0.41 J**
Zinc	103	**2.8 J**	**2.9 J**	**2.4 J**
Other Parameters (MG/L)				
Hardness	--	**84.6**	NA	**86.4**

Notes:
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
NA - Not analyzed

TABLE B-40

Ecological Screening Statistics - AOC 6 Surface Sediment

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value		Frequency of Exceedance[1]	Maximum Hazard Quotient	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																	
Di-n-octylphthalate	480 - 480	1 / 2	2,500	2,500	CAA06-SD01-1008	1,370	1,598	8,505	775	50,600	EqP	0 / 2	0.05	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	480 - 480	1 / 2	3,300	3,300	CAA06-SD01-1008	1,770	2,164	11,430	890	750	SLC	1 / 2	4.40	**NO**	--	--	NO
	480 - 480	1 / 2	3,300	3,300	CAA06-SD01-1008	1,770	2,164	11,430	890	4,094,000	EqP	0 / 2	0.001	NO	--	--	NO
Explosives (UG/KG)																	
4-Amino-2,6-dinitrotoluene	100 - 100	1 / 2	110	110	CAA06-SD01-1008	80.0	42.4	269	74.2	107	EqP	1 / 2	1.03	**YES**	2.52	0.75	NO
Inorganics (MG/KG)																	
Aluminum	-- - --	2 / 2	1,460	2,200	CAA06-SD01-1008	1,830	523	4,166	1,792	25,500	SLC	0 / 2	0.09	NO	--	--	NO
Antimony	4.80 - 4.80	1 / 2	0.17	0.17	CAA06-SD01-1008	1.29	1.58	8.32	0.64	3.00	SLC	0 / 2	0.06	NO	--	--	NO
Arsenic	-- - --	2 / 2	1.20	12.1	CAA06-SD01-1008	6.65	7.71	41.1	3.81	9.79	SLC	1 / 2	1.24	**YES**	4.19	0.68	NO
Barium	-- - --	2 / 2	4.10	9.40	CAA06-SD01-1008	6.75	3.75	23.5	6.21	20.0	SLC	0 / 2	0.47	NO	--	--	NO
Beryllium	-- - --	2 / 2	0.070	0.18	CAA06-SD01-1008	0.13	0.078	0.47	0.11	NSV	--	-- / --	NSV	**YES**	NSV	NSV	**NO**
Calcium [2]	-- - --	2 / 2	614	1,680	CAA06-SD01-1008	1,147	754	4,512	1,016	--	--	-- / --	NSV	NO	--	--	NO
Chromium	-- - --	2 / 2	2.90	5.00	CAA06-SD01-1008	3.95	1.48	10.6	3.81	43.4	SLC	0 / 2	0.12	NO	--	--	NO
Cobalt	-- - --	2 / 2	0.35	0.67	CAA06-SD01-1008	0.51	0.23	1.52	0.48	50.0	SLC	0 / 2	0.01	NO	--	--	NO
Iron	-- - --	2 / 2	1,820	4,840	CAA06-SD01-1008	3,330	2,135	12,864	2,968	20,000	SLC	0 / 2	0.24	NO	--	--	NO
Lead	-- - --	2 / 2	2.90	11.0	CAA06-SD01-1008	6.95	5.73	32.5	5.65	35.8	SLC	0 / 2	0.31	NO	--	--	NO
Magnesium [2]	-- - --	2 / 2	109	206	CAA06-SD01-1008	158	68.6	464	150	--	--	-- / --	NSV	NO	--	--	NO
Manganese	-- - --	2 / 2	15.2	37.1	CAA06-SD01-1008	26.2	15.5	95.3	23.7	460	SLC	0 / 2	0.08	NO	--	--	NO
Nickel	-- - --	2 / 2	0.88	1.70	CAA06-SD01-1008	1.29	0.58	3.88	1.22	22.7	SLC	0 / 2	0.07	NO	--	--	NO
Potassium [2]	-- - --	2 / 2	99.0	195	CAA06-SD01-1008	147	67.9	450	139	--	--	-- / --	NSV	NO	--	--	NO
Sodium [2]	-- - --	2 / 2	10.7	29.2	CAA06-SD01-1008	20.0	13.1	78.4	17.7	--	--	-- / --	NSV	NO	--	--	NO
Vanadium	-- - --	2 / 2	3.80	5.90	CAA06-SD01-1008	4.85	1.48	11.5	4.73	57.0	SLC	0 / 2	0.10	NO	--	--	NO
Zinc	-- - --	2 / 2	6.90	12.1	CAA06-SD01-1008	9.50	3.68	25.9	9.14	121	SLC	0 / 2	0.10	NO	--	--	NO
Other Parameters																	
Total organic carbon (MG/KG)	-- - --	2 / 2	23,000	69,000	CAA06-SD01-1008	46,000	32,527	191,216	39,837	--	--	-- / --	--	--	--	--	--
pH	-- - --	2 / 2	7.60	7.80	CAA06-SD02-1008	7.70	0.14	8.33	7.70	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-41
Exceedances - AOC 6 Surface Sediment
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**SLC Sediment Screening Value - Fresh**	**Equilibrium Partitioning Value (1)**	CAA06-SD01		CAA06-SD02
Sample ID			CAA06-SD01-1008	CAA06-SD01P-1008	CAA06-SD02-1008
Sample Date			10/23/08	10/23/08	10/23/08
Semivolatile Organic Compounds (UG/KG)					
Di-n-octylphthalate	--	50,600	**2,500 J**	480 UJ	480 UJ
bis(2-Ethylhexyl)phthalate	750	4,094,000	**3,300 J**	480 UJ	480 U
Explosives (UG/KG)					
4-Amino-2,6-dinitrotoluene	--	107	99 U	**110**	100 U
Inorganics (MG/KG)					
Aluminum	25,500	--	**2,200 J**	**626 J**	**1,460**
Antimony	3.00	--	**0.17 L**	**0.06 L**	4.8 UL
Arsenic	9.79	--	**12.1 J**	**3.7 J**	**1.2 J**
Barium	20.0	--	**9.4 J**	**2.9 J**	**4.1 J**
Beryllium	--	--	**0.18 J**	**0.06 J**	**0.07 J**
Chromium	43.4	--	**5 J**	**1.8 J**	**2.9 J**
Cobalt	50.0	--	**0.67 J**	**0.2 J**	**0.35 J**
Iron	20,000	--	**4,840 J**	**1,920 J**	**1,820 J**
Lead	35.8	--	**11 J**	**6.8 J**	**2.9 J**
Manganese	460	--	**37.1**	**13.6**	**15.2**
Nickel	22.7	--	**1.7 J**	**0.56 J**	**0.88 J**
Vanadium	57.0	--	**5.9 J**	**2.2 J**	**3.8 J**
Zinc	121	--	**12.1**	**3.5 J**	**6.9**
Other Parameters					
Total organic carbon (MG/KG)	--	--	**69,000 K**	NA	**23,000 K**
pH	--	--	**7.6**	NA	**7.8**

Notes:

1 - Adjusted based upon the mean TOC of 4.60%

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

TABLE B-42

Ecological Screening Statistics - AOC 6 Subsurface Sediment

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value		Frequency of Exceedance[1]	Maximum Hazard Quotient	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Explosives (UG/KG)																	
2,4,6-Trinitrotoluene	100 - 100	1 / 2	150	150	CAA06-SSD02-1008	100	70.7	416	86.6	308	EqP	0 / 2	0.49	NO	--	--	NO
2,6-Dinitrotoluene	100 - 100	1 / 2	260	260	CAA06-SSD02-1008	155	148	818	114	187	EqP	1 / 2	1.39	**YES**	4.37	0.83	NO
Inorganics (MG/KG)																	
Aluminum	-- - --	2 / 2	1,690	5,760	CAA06-SSD02-1008	3,725	2,878	16,573	3,120	25,500	SLC	0 / 2	0.23	NO	--	--	NO
Antimony	4.80 - 4.80	1 / 2	0.18	0.18	CAA06-SSD01-1008	1.29	1.57	8.30	0.66	3.00	SLC	0 / 2	0.06	NO	--	--	NO
Arsenic	-- - --	2 / 2	4.60	6.90	CAA06-SSD01-1008	5.75	1.63	13.0	5.63	9.79	SLC	0 / 2	0.70	NO	--	--	NO
Barium	-- - --	2 / 2	8.30	16.4	CAA06-SSD02-1008	12.4	5.73	37.9	11.7	20.0	SLC	0 / 2	0.82	NO	--	--	NO
Beryllium	-- - --	2 / 2	0.12	0.19	CAA06-SSD02-1008	0.16	0.049	0.38	0.15	NSV	--	-- / --	NSV	**YES**	NSV	NSV	**NO**
Calcium [2]	-- - --	2 / 2	2,780	2,960	CAA06-SSD02-1008	2,870	127	3,438	2,869	NSV	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	2 / 2	2.90	7.60	CAA06-SSD02-1008	5.25	3.32	20.1	4.69	43.4	SLC	0 / 2	0.18	NO	--	--	NO
Cobalt	-- - --	2 / 2	0.49	1.20	CAA06-SSD02-1008	0.85	0.50	3.09	0.77	50.0	SLC	0 / 2	0.02	NO	--	--	NO
Copper	-- - --	2 / 2	2.70	4.00	CAA06-SSD02-1008	3.35	0.92	7.45	3.29	31.6	SLC	0 / 2	0.13	NO	--	--	NO
Iron	-- - --	2 / 2	3,610	4,740	CAA06-SSD02-1008	4,175	799	7,742	4,137	20,000	SLC	0 / 2	0.24	NO	--	--	NO
Lead	-- - --	2 / 2	6.40	11.5	CAA06-SSD02-1008	8.95	3.61	25.1	8.58	35.8	SLC	0 / 2	0.32	NO	--	--	NO
Magnesium [2]	-- - --	2 / 2	174	416	CAA06-SSD02-1008	295	171	1,059	269	NSV	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	2 / 2	38.1	53.2	CAA06-SSD02-1008	45.7	10.7	93.3	45.0	460	SLC	0 / 2	0.12	NO	--	--	NO
Nickel	-- - --	2 / 2	1.30	3.30	CAA06-SSD02-1008	2.30	1.41	8.61	2.07	22.7	SLC	0 / 2	0.15	NO	--	--	NO
Potassium [2]	-- - --	2 / 2	137	293	CAA06-SSD02-1008	215	110	707	200	NSV	--	-- / --	--	NO	--	--	NO
Sodium [2]	-- - --	2 / 2	28.6	38.4	CAA06-SSD02-1008	33.5	6.93	64.4	33.1	NSV	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	2 / 2	4.40	10.2	CAA06-SSD02-1008	7.30	4.10	25.6	6.70	57.0	SLC	0 / 2	0.18	NO	--	--	NO
Zinc	-- - --	2 / 2	10.0	28.9	CAA06-SSD02-1008	19.5	13.4	79.1	17.0	121	SLC	0 / 2	0.24	NO	--	--	NO
Other Parameters																	
Total organic carbon (MG/KG)	-- - --	2 / 2	31,000	36,000	CAA06-SSD01-1008	33,500	3,536	49,284	33,407	--	--	-- / --	--	--		--	--
pH	-- - --	2 / 2	7.30	7.40	CAA06-SSD01-1008	7.35	0.071	7.67	7.35	--	--	-- / --	--	--		--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-43
Exceedances - AOC 6 Subsurface Sediment
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**SLC Sediment Screening Value - Fresh**	**Equilibrium Partitioning Value (1)**	CAA06-SD01	CAA06-SD02
Sample ID			CAA06-SSD01-1008	CAA06-SSD02-1008
Sample Date			10/23/08	10/23/08
Semivolatile Organic Compounds (UG/KG)				
No Detections	--	--	NA	NA
Explosives (UG/KG)				
2,4,6-Trinitrotoluene	--	308	100 U	**150**
2,6-Dinitrotoluene	--	187	100 U	**260**
Inorganics (MG/KG)				
Aluminum	25,500	--	**1,690**	**5,760**
Antimony	3.00	--	**0.18 L**	4.8 UL
Arsenic	9.79	--	**6.9 J**	**4.6 J**
Barium	20.0	--	**8.3 J**	**16.4**
Beryllium	--	--	**0.12 J**	**0.19 J**
Chromium	43.4	--	**2.9 J**	**7.6 J**
Cobalt	50.0	--	**0.49 J**	**1.2 J**
Copper	31.6	--	**2.7**	**4**
Iron	20,000	--	**3,610 J**	**4,740 J**
Lead	35.8	--	**6.4 J**	**11.5 J**
Manganese	460	--	**38.1**	**53.2**
Nickel	22.7	--	**1.3 J**	**3.3**
Vanadium	57.0	--	**4.4 J**	**10.2 J**
Zinc	121	--	**10**	**28.9**
Other Parameters				
Total organic carbon (MG/KG)	--	--	**36,000 K**	**31,000 K**
pH	--	--	**7.4**	**7.3**

Notes:
1 - Adjusted based upon the mean TOC of 3.35%
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
NA - Not analyzed

TABLE B-44
Ecological Screening Statistics - AOC 7 Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																			
Phenol	360 - 390	1 / 7	420	420	CAA07-SS02-1008	223	87.1	287	213	1,880	0 / 7	0.22	--	-- / --	--	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	360 - 390	1 / 7	6,700	6,700	CAA07-SS02-1008	1,120	2,461	2,927	316	30,000	0 / 7	0.22	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	3.70 - 3.90	2 / 7	0.33	11.0	CAA07-SS02-1008	3.00	3.58	5.63	1.92	583	0 / 7	0.02	--	-- / --	--	NO	--	--	NO
4,4'-DDE	3.70 - 3.90	2 / 7	0.23	6.00	CAA07-SS02-1008	2.27	1.76	3.56	1.67	114	0 / 7	0.05	--	-- / --	--	NO	--	--	NO
4,4'-DDT	3.70 - 3.90	2 / 7	1.70	7.70	CAA07-SS02-1008	2.72	2.20	4.34	2.31	100	0 / 7	0.08	--	-- / --	--	NO	--	--	NO
Aldrin	1.90 - 2.00	1 / 7	0.27	0.27	CAA07-SS02-1008	0.87	0.26	1.06	0.81	3.63	0 / 7	0.07	--	-- / --	--	NO	--	--	NO
Dieldrin	3.70 - 3.90	1 / 7	0.22	0.22	CAA07-SS02-1008	1.68	0.65	2.16	1.41	10.5	0 / 7	0.02	--	-- / --	--	NO	--	--	NO
alpha-BHC	1.90 - 2.10	1 / 7	0.28	0.28	CAA07-SS01-1008	0.88	0.27	1.07	0.82	226	0 / 7	0.001	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	7 / 7	6,620	13,000	CAA07-SS05-1008	7,993	2,275	9,664	7,777	pH < 5.5	0 / 7	--	--	-- / --	--	NO	--	--	NO
Antimony	4.60 - 52.0	1 / 7	0.52	0.52	CAA07-SS03-1008	5.80	8.95	12.4	3.03	78.0	0 / 7	0.01	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	7 / 7	2.50	23.3	CAA07-SS02-1008	6.93	7.45	12.4	4.99	18.0	1 / 7	1.29	6.36	2 / 7	3.66	**YES**	0.69	0.38	NO
Barium	-- - --	7 / 7	36.2	55.4	CAA07-SS01-1008	46.1	7.62	51.7	45.5	330	0 / 7	0.17	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	7 / 7	0.27	0.65	CAA07-SS04-1008	0.53	0.13	0.63	0.52	40.0	0 / 7	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.010 - 4.40	3 / 7	0.040	2.50	CAA07-SS03-1008	0.73	1.12	1.55	0.11	32.0	0 / 7	0.08	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	7 / 7	409	1,910	CAA07-SS01-1008	1,417	532	1,808	1,285	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	7 / 7	7.70	136	CAA07-SS03-1008	35.5	48.2	70.9	18.6	64.0	1 / 7	2.13	18.2	2 / 7	7.47	**YES**	1.11	0.55	NO
Cobalt	-- - --	7 / 7	2.50	10.3	CAA07-SS02-1008	4.51	2.88	6.63	3.92	13.0	0 / 7	0.79	--	-- / --	--	NO	--	--	NO
Copper	-- - --	7 / 7	2.90	77.4	CAA07-SS02-1008	20.8	30.6	43.3	7.90	70.0	1 / 7	1.11	4.25	2 / 7	18.2	**YES**	0.62	0.30	NO
Iron	-- - --	7 / 7	5,830	213,000	CAA07-SS02-1008	46,640	77,064	103,240	17,176	5 < pH > 8	0 / 7	--	--	-- / --	--	NO	--	--	NO
Lead	-- - --	7 / 7	9.80	984	CAA07-SS03-1008	186	364	454	32.4	120	2 / 7	8.20	17.4	2 / 7	56.6	**YES**	3.78	1.55	**YES**
Magnesium [2]	-- - --	7 / 7	638	991	CAA07-SS05-1008	729	125	820	721	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	7 / 7	132	921	CAA07-SS02-1008	328	280	533	260	220	4 / 7	4.19	324	2 / 7	2.84	**YES**	2.42	1.49	**YES**
Nickel	-- - --	7 / 7	3.70	33.3	CAA07-SS02-1008	11.9	12.8	21.3	7.68	38.0	0 / 7	0.88	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	7 / 7	415	783	CAA07-SS05-1008	558	148	667	542	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Silver	0.77 - 1.10	2 / 7	0.76	2.60	CAA07-SS02-1008	0.82	0.79	1.40	0.64	560	0 / 7	0.005	--	-- / --	--	NO	--	--	NO
Sodium [2]	11.9 - 13.4	4 / 7	14.8	29.5	CAA07-SS03-1008	16.2	10.3	23.7	13.2	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	7 / 7	12.1	26.5	CAA07-SS05-1008	15.7	5.10	19.4	15.1	130	0 / 7	0.20	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	7 / 7	15.8	840	CAA07-SS03-1008	143	308	369	39.0	120	1 / 7	7.00	26.5	2 / 7	31.7	**YES**	3.07	1.19	**YES**
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	7 / 7	17,000	40,000	CAA07-SS02-1008	26,571	7,934	32,399	25,596	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	7 / 7	5.70	7.30	CAA07-SS01-1008	6.49	0.63	6.95	6.46	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE B-45
Exceedances - AOC 7 Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID			CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008	CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date			10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/31/08	10/31/08
Volatile Organic Compounds (UG/KG)										
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (UG/KG)										
Phenol	1,880	--	390 U	**420 J**	380 U	370 U	380 U	390 U	360 U	380 U
bis(2-Ethylhexyl)phthalate	30,000	--	390 U	**6,700**	380 U	370 U	380 U	390 U	360 U	380 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										
4,4'-DDD	583	--	3.9 U	**11.0**	**0.33 J**	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
4,4'-DDE	114	--	3.9 U	**6.0**	**0.23 J**	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
4,4'-DDT	100	--	3.9 U	**7.7**	**1.7 J**	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Aldrin	3.63	--	2.0 U	**0.27 J**	1.9 U	1.9 U	1.9 U	2.0 U	1.9 U	1.9 U
Dieldrin	10.5	--	3.9 U	**0.22 J**	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
alpha-BHC	226	--	**0.28 J**	2.1 U	1.9 U	1.9 U	1.9 U	2.0 U	1.9 U	1.9 U
Explosives (UG/KG)										
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)										
Aluminum	pH < 5.5	12,200	**6,710**	**6,620**	**5,880**	**7,190**	**6,810**	**13,000**	**7,400**	**8,220**
Antimony	78.0	11.0	5.3 UL	52 UL	**0.52 L**	5.2 UL	6.1 UL	6.4 UL	4.6 UL	5.8 UL
Arsenic	18.0	6.36	**2.5 L**	**23.3 L**	**7.9 L**	**3.7 L**	**3.8 L**	**5.1 L**	**2.8 L**	**3.1 L**
Barium	330	52.9	**55.4**	**36.2**	**43.2**	**48.6**	**37.5**	**43.6**	**46.5**	**54.9**
Beryllium	40.0	0.587	**0.47**	**0.27 J**	**0.45 J**	**0.56**	**0.65**	**0.57**	**0.62**	**0.60**
Cadmium	32.0	1.50	**0.06 J**	4.4 U	**2.5 J**	**0.50 J**	0.01 B	0.53 U	**0.04 J**	0.03 B
Chromium	64.0	18.2	**8.2 K**	**60.6 K**	**136 K**	**58.1 K**	**9.7 K**	**17.2**	**7.7 K**	**8.8 K**
Cobalt	13.0	9.93	**2.5 J**	**10.3 J**	**5.8 J**	**4.3 J**	**2.5 J**	**5.0 J**	**2.7 J**	**2.8 J**
Copper	70.0	4.25	**4.00**	**77.4**	**51.0 J**	**10.1 J**	**3.00**	**3.40**	**2.90**	**4.10**
Iron	5 < pH > 8	19,900	**6,410**	**213,000**	**71,100 J**	**20,500 J**	**7,660**	**16,200**	**5,830**	**6,280**
Lead	120	17.4	**9.8**	**264**	**984**	**486**	**11.2**	**10.5**	**9.8**	**12.9**
Manganese	220	324	**140 L**	**921 L**	**436 L**	**263 L**	**232 L**	**132 L**	**205 L**	**227 L**
Nickel	38.0	9.52	**3.7**	**33.3 J**	**27.5 J**	**8.1 J**	**3.9 J**	**5.9 J**	**4.2**	**4.8**
Silver	560	2.10	0.89 U	**2.6 J**	**0.76 J**	**0.11 J**	1.0 U	1.1 U	0.77 U	0.98 U
Vanadium	130	27.9	**12.1**	**15.6 J**	**11.2 J**	**12.2**	**16.5**	**26.5**	**12.2**	**14.5**
Zinc	120	26.5	**22.3**	**61.3**	**840**	**388**	**15.8**	**19.9 L**	**16.8**	**22.8**
Other Parameters										
Total organic carbon (MG/KG)	--	--	**25,000**	**40,000**	**32,000**	NA	**30,000**	**17,000**	**21,000**	**21,000**
pH	--	--	**7.3**	**6.7**	**7.1**	NA	**5.7**	**5.7**	**6.6**	**6.3**

Notes:
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
NA - Not analyzed
Equals or exceeds Background UTL

TABLE B-46

Ecological Screening Statistics - AOC 7 Subsurface Soil

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Semivolatile Organic Compounds (UG/KG)																			
Phenol	360 - 380	1 / 6	270	270	CAA07-SB06-1008	198	35.7	227	195	1,880	0 / 6	0.14	--	-- / --	--	NO	--	--	NO
bis(2-Ethylhexyl)phthalate	360 - 380	1 / 6	7,400	7,400	CAA07-SB06-1008	1,386	2,946	3,810	339	30,000	0 / 6	0.25	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDT	3.60 - 4.00	2 / 6	0.75	0.97	CAA07-SB03-1008	1.53	0.53	1.96	1.43	100	0 / 6	0.01	--	-- / --	--	NO	--	--	NO
Dieldrin	3.60 - 4.00	1 / 6	0.29	0.29	CAA07-SB03-1008	1.60	0.65	2.13	1.36	10.5	0 / 6	0.03	--	-- / --	--	NO	--	--	NO
Endrin	3.60 - 4.00	2 / 6	0.33	0.40	CAA07-SB01-1008	1.36	0.78	2.00	1.08	1.95	0 / 6	0.21	--	-- / --	--	NO	--	--	NO
Heptachlor	1.80 - 2.00	1 / 6	0.25	0.25	CAA07-SB03-1008	0.83	0.28	1.06	0.75	52.9	0 / 6	0.005	--	-- / --	--	NO	--	--	NO
Explosives (UG/KG)																			
Nitroguanidine	130 - 130	1 / 6	63.0	63.0	CAA07-SB04-1008	64.7	0.82	65.3	64.7	NSV	-- / --	NSV	--	-- / --	--	YES	NSV	NSV	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	6 / 6	6,640	22,900	CAA07-SB05-1008	12,095	6,505	17,446	10,871	pH < 5.5	2 / 6	--	13,000	2 / 6	1.76	YES	mean pH > 5.5		NO
Arsenic	-- - --	6 / 6	2.40	8.10	CAA07-SB05-1008	4.08	2.29	5.97	3.65	18.0	0 / 6	0.45	--	-- / --	--	NO	--	--	NO
Barium	-- - --	6 / 6	44.5	50.7	CAA07-SB04-1008	46.6	2.25	48.5	46.6	330	0 / 6	0.15	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	6 / 6	0.45	0.74	CAA07-SB04-1008	0.56	0.11	0.65	0.56	40.0	0 / 6	0.02	--	-- / --	--	NO	--	--	NO
Cadmium	0.33 - 0.49	2 / 6	0.040	0.63	CAA07-SB03-1008	0.26	0.20	0.42	0.20	32.0	0 / 6	0.02	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	6 / 6	160	1,020	CAA07-SB01-1008	623	333	896	531	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	6 / 6	8.00	29.3	CAA07-SB05-1008	17.8	9.94	25.9	15.4	64.0	0 / 6	0.46	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	6 / 6	2.60	5.20	CAA07-SB05-1008	3.27	0.99	4.08	3.17	13.0	0 / 6	0.40	--	-- / --	--	NO	--	--	NO
Copper	-- - --	6 / 6	2.30	5.10	CAA07-SB03-1008	3.15	1.07	4.03	3.02	70.0	0 / 6	0.07	--	-- / --	--	NO	--	--	NO
Iron	-- - --	6 / 6	5,690	30,200	CAA07-SB05-1008	13,187	9,569	21,058	10,833	5 < pH > 8	0 / 6	--	--	-- / --	--	NO	--	--	NO
Lead	-- - --	6 / 6	5.50	175	CAA07-SB03-1008	35.5	68.4	91.7	12.6	120	1 / 6	1.46	8.79	3 / 6	19.9	YES	0.76	0.30	NO
Magnesium [2]	-- - --	6 / 6	598	1,490	CAA07-SB05-1008	914	360	1,210	862	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	6 / 6	53.6	270	CAA07-SB04-1008	115	79.0	180	99.2	220	1 / 6	1.23	176	1 / 6	1.53	YES	0.82	0.52	NO
Mercury	0.11 - 0.11	1 / 6	0.040	0.040	CAA07-SB05-1008	0.053	0.0061	0.058	0.052	0.10	0 / 6	0.40	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	6 / 6	3.80	7.60	CAA07-SB05-1008	5.35	1.44	6.54	5.19	38.0	0 / 6	0.20	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	6 / 6	344	1,270	CAA07-SB05-1008	685	379	997	609	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.30 - 3.20	2 / 6	0.46	0.64	CAA07-SB01-1008	1.08	0.44	1.44	0.98	0.52	1 / 6	1.23	0.64	1 / 6	1.00	YES	--	--	NO
Silver	0.66 - 0.98	1 / 6	0.11	0.11	CAA07-SB03-1008	0.38	0.14	0.50	0.34	560	0 / 6	0.0002	--	-- / --	--	NO	--	--	NO
Sodium [2]	12.5 - 15.0	4 / 6	14.7	38.0	CAA07-SB01-1008	20.3	12.9	31.0	16.5	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	6 / 6	9.00	44.4	CAA07-SB05-1008	21.6	14.0	33.2	18.4	130	0 / 6	0.34	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	6 / 6	11.8	282	CAA07-SB03-1008	60.3	109	150	25.1	120	1 / 6	2.35	28.0	1 / 6	10.1	YES	1.25	0.50	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	6 / 6	5,800	14,000	CAA07-SB05-1008	9,950	2,956	12,381	9,561	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	6 / 6	5.20	6.70	CAA07-SB03-1008	6.02	0.64	6.54	5.99	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-47
Exceedances - AOC 7 Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA07-SO01	CAA07-SO03		CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID			CAA07-SB01-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008	CAA07-SB05-1008	CAA07-SB06-1008	CAA07-SB07-1008
Sample Date			10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/31/08	10/31/08
Volatile Organic Compounds (UG/KG)									
No Detections	--	--							
Semivolatile Organic Compounds (UG/KG)									
Phenol	1,880	--	370 U	350 U	360 U	360 U	380 U	**270 J**	360 U
bis(2-Ethylhexyl)phthalate	30,000	--	370 U	350 U	360 U	360 U	380 U	**7,400**	360 U
Pesticide/Polychlorinated Biphenyls (UG/KG)									
4,4'-DDT	100	--	**0.75 J**	3.6 U	**0.97 J**	3.7 U	4.0 U	3.6 U	3.6 U
Dieldrin	10.5	--	3.7 U	3.6 U	**0.29 J**	3.7 U	4.0 U	3.6 U	3.6 U
Endrin	1.95	--	**0.4 J**	3.6 U	**0.33 J**	3.7 U	4.0 U	3.6 U	3.6 U
Heptachlor	52.9	--	1.9 U	1.8 U	**0.25 J**	1.9 U	2.0 U	1.8 U	1.8 U
Explosives (UG/KG)									
Nitroguanidine	--	--	130 U	130 U	130 U	**63 J**	130 U	130 U	130 U
Inorganics (MG/KG)									
Aluminum	pH < 5.5	13,000	**17,300**	**7,390**	**8,080**	**6,640**	**22,900**	**9,310**	**8,340**
Arsenic	18.0	5.54	**5.6 L**	**2.3 L**	**2.8 L**	**2.6 L**	**8.1 L**	**3.0 L**	**2.4 L**
Barium	330	84.5	**46.4**	**45.8**	**47.3**	**50.7**	**46.1**	**44.5**	**44.8**
Beryllium	40.0	0.52	**0.50**	**0.44**	**0.45**	**0.74**	**0.65**	**0.52**	**0.52**
Cadmium	32.0	--	0.49 U	**0.38**	**0.63**	**0.04 J**	0.49 U	0.45 U	0.33 U
Chromium	64.0	33.7	**20.6 K**	**29.1 K**	**12.0 K**	**8.0**	**29.3**	**10.8 K**	**8.8 K**
Cobalt	13.0	5.18	**3.4 J**	**2.6 J**	**2.8 J**	**2.6 J**	**5.2 J**	**2.8 J**	**2.8 J**
Copper	70.0	3.17	**3.0**	**2.2**	**5.1**	**2.3**	**3.6**	**2.5**	**2.4**
Iron	5 < pH > 8	32,000	**18,200**	**6,150**	**11,500**	**5,690**	**30,200**	**7,680**	**5,850**
Lead	120	8.79	**9.2**	**175 J**	**26.8 J**	**5.5**	**9.8**	**7.2**	**6.4**
Manganese	220	176	**53.6 L**	**85.6 L**	**94.8 L**	**270 L**	**62.0 L**	**108 L**	**104 L**
Mercury	0.10	0.14	0.11 UL	0.11 UL	0.086 UL	0.11 U	**0.04 J**	0.11 UL	0.11 UL
Nickel	38.0	17.6	**6.2**	**4.0**	**5.8**	**3.8 J**	**7.6 J**	**4.5**	**4.2**
Selenium	0.52	0.64	**0.64 J**	2.1 U	2.4 U	2.8 UL	**0.46 L**	3.2 UL	2.3 UL
Silver	560	1.10	0.98 U	0.6 U	**0.11 J**	0.8 U	0.98 U	0.9 U	0.66 U
Vanadium	130	48.3	**33.4**	**12.0**	**13.7**	**9.0**	**44.4**	**16.3**	**12.9**
Zinc	120	28.0	**18.7**	**235**	**282**	**12.1 L**	**22.4 L**	**14.8**	**11.8**
Other Parameters									
Total organic carbon (MG/KG)	--	--	**5,800**	**8,800**	NA	**11,000**	**14,000**	**12,000**	**8,100**
pH	--	--	**6.6**	**6.7**	NA	**5.3**	**5.2**	**6.2**	**6.1**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-48

Ecological Screening Statistics - AOC 7 Groundwater

WPNSTA Cheatham Annex

Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Volatile Organic Compounds (UG/L)																				
Acetone	10.0 - 10.0	2 / 4	2.00	2.00	CAA07-DW01-1008	3.50	1.73	5.54	3.16	1,500	0 / 4	0.001	--	-- / --	--	NO	--	--	NO	NO
Ethylbenzene	10.0 - 10.0	1 / 4	2.00	2.00	CAA07-DW01-1008	4.25	1.50	6.02	3.98	290	0 / 4	0.01	--	-- / --	--	NO	--	--	NO	NO
Toluene	10.0 - 10.0	1 / 4	1.00	1.00	CAA07-DW01-1008	4.00	2.00	6.35	3.34	9.80	0 / 4	0.10	--	-- / --	--	NO	--	--	NO	NO
Inorganics (UG/L)																				
Aluminum	-- - --	4 / 4	248	38,500	CAA07-DW01-1008	11,067	18,336	32,643	2,869	87.0	4 / 4	443	2,230	2 / 4	17.3	**(NO)**	375	127	**(NO)**	**(NO)**
Antimony	60.0 - 60.0	3 / 4	1.00	14.4	CAA07-DW01-1008	11.9	13.5	27.8	5.49	30.0	0 / 4	0.48	--	-- / --	--	NO	--	--	NO	NO
Arsenic	4.00 - 7.30	2 / 4	12.8	78.9	CAA07-DW01-1008	24.3	36.7	67.5	9.27	150	0 / 4	0.53	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	27.5	109	CAA07-DW01-1008	52.8	37.8	97.2	45.2	4.00	4 / 4	27.3	118	0 / 4	0.92	NO	--	--	NO	NO
Beryllium	5.00 - 5.00	2 / 4	0.18	2.60	CAA07-DW01-1008	1.95	1.18	3.33	1.31	0.66	1 / 4	3.94	2.45	1 / 4	1.06	**(NO)**	5.05	2.95	**(NO)**	NO
Cadmium	0.21 - 0.34	2 / 4	1.40	1.50	CAA07-DW03-1008	0.79	0.76	1.69	0.44	0.27	2 / 4	5.54	0.605	2 / 4	2.48	**(NO)**	6.23	2.93	**(NO)**	NO
Calcium [2]	-- - --	4 / 4	114,000	793,000	CAA07-DW01-1008	316,000	319,701	692,186	231,229	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	4 / 4	1.40	167	CAA07-DW01-1008	48.2	79.4	142	13.6	11.4	2 / 4	14.6	15.1	1 / 4	11.1	**(NO)**	12.4	4.23	**(NO)**	NO
Cobalt	-- - --	4 / 4	0.96	14.9	CAA07-DW01-1008	5.09	6.57	12.8	2.90	23.0	0 / 4	0.65	--	-- / --	--	NO	--	--	NO	NO
Copper	-- - --	4 / 4	1.40	44.8	CAA07-DW01-1008	14.5	20.3	38.5	6.74	9.33	1 / 4	4.80	12.2	1 / 4	3.67	**(NO)**	4.12	1.56	**(NO)**	NO
Iron	-- - --	4 / 4	545	123,000	CAA07-DW01-1008	33,971	59,432	103,903	6,935	1,000	3 / 4	123	894	3 / 4	138	**(NO)**	104	34.0	**(NO)**	**(NO)**
Lead	1.10 - 4.60	1 / 4	30.7	30.7	CAA07-DW01-1008	8.84	14.6	26.0	2.89	3.18	1 / 4	9.65	21.3	1 / 4	1.44	**(NO)**	8.17	2.78	**(NO)**	NO
Magnesium [2]	-- - --	4 / 4	2,560	14,200	CAA07-DW01-1008	6,368	5,414	12,739	4,983	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	16.8	180	CAA07-DW01-1008	81.2	71.3	165	57.9	120	1 / 4	1.50	57.9	2 / 4	3.11	**(NO)**	1.38	0.68	NO	NO
Nickel	-- - --	4 / 4	5.80	83.0	CAA07-DW01-1008	27.5	37.1	71.1	15.2	52.2	1 / 4	1.59	11.4	1 / 4	7.28	**(NO)**	1.36	0.53	NO	NO
Potassium [2]	-- - --	4 / 4	1,710	16,200	CAA07-DW01-1008	5,705	7,018	13,963	3,554	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Selenium	35.0 - 35.0	2 / 4	1.30	26.9	CAA07-DW01-1008	15.8	10.6	28.3	10.2	5.00	1 / 4	5.38	--	-- / --	--	**(NO)**	5.66	3.16	**(NO)**	NO
Sodium [2]	-- - --	4 / 4	5,830	14,500	CAA07-DW01-1008	9,033	3,918	13,642	8,465	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	4 / 4	0.75	203	CAA07-DW01-1008	56.4	97.9	172	11.3	20.0	1 / 4	10.2	26.2	1 / 4	7.75	**(NO)**	8.58	2.82	**(NO)**	NO
Zinc	-- - --	4 / 4	4.30	157	CAA07-DW01-1008	47.5	73.2	134	19.2	120	1 / 4	1.31	4.52	3 / 4	34.7	**(NO)**	1.12	0.40	NO	NO
Dissolved Metals (UG/L)																				
Aluminum	-- - --	4 / 4	145	2,450	CAA07-DW02-1008	744	1,138	2,083	336	87.0	4 / 4	28.2	100	4 / 4	24.5	**YES**	23.9	8.55	**YES**	NO
Antimony	60.0 - 60.0	1 / 4	0.87	0.87	CAA07-DW04-1008	22.7	14.6	39.9	12.4	30.0	0 / 4	0.03	--	-- / --	--	NO	--	--	NO	NO
Arsenic	3.50 - 7.50	1 / 4	2.20	2.20	CAA07-DW01-1008	2.46	0.88	3.50	2.36	150	0 / 4	0.01	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	12.4	35.6	CAA07-DW02-1008	25.0	9.57	36.2	23.3	4.00	4 / 4	8.90	127	0 / 4	0.28	NO	--	--	NO	NO
Calcium [2]	-- - --	4 / 4	106,000	163,000	CAA07-DW02-1008	140,500	27,012	172,285	138,428	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	-- - --	4 / 4	0.67	7.30	CAA07-DW02-1008	2.42	3.26	6.25	1.37	11.0	0 / 4	0.66	--	-- / --	--	NO	--	--	NO	NO
Cobalt	0.44 - 0.88	1 / 4	2.10	2.10	CAA07-DW02-1008	0.78	0.88	1.82	0.52	23.0	0 / 4	0.09	--	-- / --	--	NO	--	--	NO	NO
Copper	-- - --	4 / 4	1.40	2.70	CAA07-DW02-1008	1.88	0.57	2.55	1.82	8.96	0 / 4	0.30	--	-- / --	--	NO	--	--	NO	NO
Iron	-- - --	4 / 4	198	3,940	CAA07-DW02-1008	1,171	1,847	3,344	487	1,000	1 / 4	3.94	275	2 / 4	14.3	**YES**	3.34	1.17	**YES**	NO
Magnesium [2]	-- - --	4 / 4	2,130	5,530	CAA07-DW04-1008	3,260	1,536	5,068	3,038	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	9.40	40.2	CAA07-DW03-1008	25.7	16.5	45.1	21.2	120	0 / 4	0.34	--	-- / --	--	NO	--	--	NO	NO
Nickel	-- - --	4 / 4	3.50	8.80	CAA07-DW04-1008	6.28	2.53	9.25	5.86	52.0	0 / 4	0.17	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	4 / 4	908	2,840	CAA07-DW04-1008	1,880	790	2,809	1,739	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Silver	10.0 - 10.0	1 / 4	0.36	0.36	CAA07-DW04-1008	3.84	2.32	6.57	2.59	0.36	1 / 4	1.00	--	-- / --	--	**YES**	--	--	**NO**	NO
Sodium [2]	-- - --	4 / 4	4,600	8,360	CAA07-DW04-1008	6,175	1,576	8,029	6,033	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	-- - --	4 / 4	0.53	8.00	CAA07-DW02-1008	2.52	3.66	6.82	1.25	20.0	0 / 4	0.40	--	-- / --	--	NO	--	--	NO	NO
Zinc	-- - --	4 / 4	4.80	12.2	CAA07-DW02-1008	7.05	3.49	11.2	6.53	118	0 / 4	0.10	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Macronutrient - Not considered to be a COPC

TABLE B-49
Exceedances - AOC 7 Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Fresh**	**95% UTL Yorktown-Eastover**	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID			CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date			10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Volatile Organic Compounds (UG/L)							
Acetone	1,500	--	**2 J**	10 U	10 U	**2 J**	10 U
Ethylbenzene	290	--	**2 J**	10 U	10 U	10 U	10 U
Toluene	9.80	--	**1 J**	10 U	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/L)							
No Detections	--	--	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/L)							
No Detections	--	--	NA	NA	NA	NA	NA
Explosives (UG/L)							
No Detections	--	--	NA	NA	NA	NA	NA
Inorganics (UG/L)							
Aluminum	87.0	2,230	**38,500**	**2,040**	**3,480 J**	**860 J**	**248**
Antimony	30.0	18.8	**14.4 J**	**1.0 J**	**2.1 J**	**1.1 J**	60 U
Arsenic	150	2.28	**78.9**	7.3 B	**12.8**	6.1 B	4.0 B
Barium	4.00	118	**109 J**	**36.0 J**	**38.7 J**	**29.9 J**	**27.5 J**
Beryllium	0.66	2.45	**2.6 J**	5.0 U	**0.18 J**	5.0 U	5.0 U
Cadmium	0.271	0.605	**1.4 J**	0.21 B	**1.5 J**	**0.58 J**	0.34 B
Chromium	11.4	15.1	**167**	**10.2**	**14.2**	**3.3 J**	**1.4 J**
Cobalt	23.0	20.6	**14.9 J**	**1.9 J**	**2.6 J**	1.0 B	**0.96 J**
Copper	9.33	12.2	**44.8**	**7.5 J**	**4.4 J**	**2.5 J**	**1.4 J**
Iron	1,000	894	**123,000**	**4,280**	**8,060 J**	**1,990 J**	**545**
Lead	3.18	21.3	**30.7**	3.6 B	4.6 B	1.9 B	1.1 B
Manganese	120	57.9	**180**	**44.4**	**83.7**	**39.4**	**16.8**
Nickel	52.2	11.4	**83.0**	**5.8 J**	**9.7 J**	**4.3 J**	**11.3 J**
Selenium	5.00	--	**26.9 J**	35 U	35 U	**1.3 J**	35 U
Vanadium	20.0	26.2	**203**	**7.3 J**	**14.6 J**	**3.6 J**	**0.75 J**
Zinc	120	4.52	**157**	**12.5 J**	**16.2 J**	**9.4 J**	**4.3 J**
Dissolved Metals (UG/L)							
Aluminum	87.0	100	**172 J**	**2,450**	**204**	**209**	**145 J**
Antimony	30.0	9.70	60 U	60 U	60 U	60 U	**0.87 J**
Arsenic	150	1.37	**2.2 J**	7.5 B	3.7 B	4.3 B	3.5 B
Barium	4.00	127	**12.4 J**	**35.6 J**	**26.9 J**	**26.6 J**	**24.9 J**
Chromium	11.0	6.04	**1.0 J**	**7.3 J**	**0.67 J**	**0.44 J**	**0.71 J**
Cobalt	23.0	0.70	0.44 B	**2.1 J**	0.88 B	0.73 B	0.74 B
Copper	8.96	3.00	**1.6 J**	**2.7 J**	**1.8 J**	**1.7 J**	**1.4 J**
Iron	1,000	275	**312**	**3,940**	**198**	**191**	**232**
Manganese	120	49.5	**9.4 J**	**39.6**	**40.2**	**32.4**	**13.5 J**
Nickel	52.0	12.2	**8.0 J**	**4.8 J**	**3.5 J**	**3.4 J**	**8.8 J**
Silver	0.36	--	10 U	10 U	10 U	10 U	**0.36 J**
Vanadium	20.0	4.30	**0.66 J**	**8.0 J**	**0.87 J**	**0.88 J**	**0.53 J**
Zinc	118	--	**6.2 J**	**12.2 J**	**4.8 J**	**3.6 J**	**5.0 J**

Notes:
Grey highlighting indicates value greater than screening value
Yellow highlighting indicates value equal to screening value
Bold indicates detections
NA - Not analyzed
Equals or exceeds Background UTL

TABLE B-50
Ecological Screening Statistics - AOC 8 Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
Acetone	3.00 - 12.0	1 / 9	36.0	36.0	CAA08-SS02-1008	7.56	10.8	14.3	4.39	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Semivolatile Organic Compounds (UG/KG)																			
Benzaldehyde	360 - 410	1 / 9	180	180	CAA08-SS04-1008	185	8.29	190	185	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Benzo(b)fluoranthene	360 - 410	2 / 9	270	290	CAA08-SS04-1008	206	42.9	233	203	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Benzo(k)fluoranthene	360 - 410	2 / 9	210	210	CAA08-SS04-1008	191	13.6	199	190	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Chrysene	360 - 410	1 / 9	210	210	CAA08-SS04-1008	188	11.5	195	188	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Fluoranthene	360 - 410	1 / 9	260	260	CAA08-SS04-1008	194	26.1	210	193	NSV	-- / --	LPAH	--	-- / --	--	NO	--	--	NO
PAH (HMW)	1,620 - 1,845	2 / 9	1,810	1,860	CAA08-SS04-1008	1,055	444	1,330	992	18,000	0 / 9	0.10	--	-- / --	--	NO	--	--	NO
PAH (LMW)	1,620 - 1,845	2 / 9	1,700	1,710	CAA08-SS08-1008	1,026	386	1,266	976	29,000	0 / 9	0.06	--	-- / --	--	NO	--	--	NO
Pyrene	360 - 410	1 / 9	250	250	CAA08-SS04-1008	193	22.9	207	192	NSV	-- / --	HPAH	--	-- / --	--	NO	--	--	NO
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	3.60 - 3.80	4 / 9	0.23	2.40	CAA08-SS04-1008	1.45	0.76	1.92	1.16	583	0 / 9	0.004	--	-- / --	--	NO	--	--	NO
4,4'-DDE	3.60 - 3.60	6 / 9	0.34	17.0	CAA08-SS05-1008	3.50	5.22	6.73	1.86	114	0 / 9	0.15	--	-- / --	--	NO	--	--	NO
4,4'-DDT	3.60 - 7.30	5 / 9	0.44	14.0	CAA08-SS05-1008	3.80	4.28	6.45	2.41	100	0 / 9	0.14	--	-- / --	--	NO	--	--	NO
Aroclor-1260	36.0 - 38.0	3 / 9	180	420	CAA08-SS04-1008	99.9	140	187	43.3	8,000	0 / 9	0.05	--	-- / --	--	NO	--	--	NO
Dieldrin	3.60 - 7.30	2 / 9	0.29	0.34	CAA08-SS03-1008	1.71	0.99	2.32	1.34	10.5	0 / 9	0.03	--	-- / --	--	NO	--	--	NO
Endrin aldehyde	3.60 - 3.60	5 / 9	0.33	21.0	CAA08-SS04-1008	5.46	7.04	9.83	2.44	1.95	3 / 9	10.8	--	-- / --	--	**YES**	5.04	2.80	**YES**
Heptachlor epoxide	1.80 - 2.00	1 / 9	0.76	0.76	CAA08-SS04-1008	0.91	0.067	0.95	0.91	52.9	0 / 9	0.01	--	-- / --	--	NO	--	--	NO
gamma-Chlordane	1.80 - 2.00	1 / 9	0.81	0.81	CAA08-SS04-1008	0.92	0.053	0.95	0.92	11.0	0 / 9	0.07	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	9 / 9	3,870	11,600	CAA08-SS04-1008	8,497	2,218	9,871	8,170	pH < 5.5	1 / 9	--	12,200	0 / 9	0.95	NO	--	--	NO
Antimony	5.70 - 5.70	2 / 3	0.71	1.70	CAA08-SS04-1008	1.75	1.07	3.56	1.51	78.0	0 / 3	0.02	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	9 / 9	2.40	15.4	CAA08-SS04-1008	5.12	4.36	7.82	4.12	18.0	0 / 9	0.86	--	-- / --	--	NO	--	--	NO
Barium	-- - --	9 / 9	12.1	69.1	CAA08-SS04-1008	38.1	21.2	51.2	32.5	330	0 / 9	0.21	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	9 / 9	0.20	0.55	CAA08-SS04-1008	0.38	0.11	0.45	0.36	40.0	0 / 9	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.36 - 0.36	8 / 9	0.080	0.71	CAA08-SS04-1008	0.22	0.21	0.34	0.16	32.0	0 / 9	0.02	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	9 / 9	395	6,170	CAA08-SS04-1008	1,701	1,837	2,840	1,172	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	9 / 9	7.70	26.5	CAA08-SS04-1008	14.9	6.58	19.0	13.7	64.0	0 / 9	0.41	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	9 / 9	0.72	3.30	CAA08-SS07-1008	1.89	0.84	2.41	1.72	13.0	0 / 9	0.25	--	-- / --	--	NO	--	--	NO
Copper	-- - --	9 / 9	2.00	40.3	CAA08-SS04-1008	10.2	12.7	18.1	6.18	70.0	0 / 9	0.58	--	-- / --	--	NO	--	--	NO
Iron	-- - --	9 / 9	5,020	15,800	CAA08-SS04-1008	9,241	3,217	11,235	8,779	5 < pH > 8	1 / 9	--	19,900	0 / 9	0.79	NO	--	--	NO
Lead	-- - --	9 / 9	6.40	60.7	CAA08-SS04-1008	21.5	17.8	32.5	16.6	120	0 / 9	0.51	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	9 / 9	570	3,180	CAA08-SS07-1008	1,149	871	1,688	957	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	9 / 9	23.3	170	CAA08-SS04-1008	76.4	54.0	110	59.6	220	0 / 9	0.77	--	-- / --	--	NO	--	--	NO
Mercury	0.084 - 0.13	1 / 9	0.040	0.040	CAA08-SS04-1008	0.052	0.0083	0.057	0.051	0.10	0 / 9	0.40	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	9 / 9	1.70	8.30	CAA08-SS07-1008	4.84	2.17	6.19	4.40	38.0	0 / 9	0.22	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	9 / 9	382	3,200	CAA08-SS07-1008	1,122	866	1,659	912	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.80 - 3.80	1 / 9	0.60	0.60	CAA08-SS04-1008	1.48	0.36	1.70	1.42	0.52	1 / 9	1.15	0.51	1 / 9	1.18	**YES**	--	--	**NO**
Sodium [2]	-- - --	9 / 9	18.7	125	CAA08-SS04-1008	46.0	33.6	66.8	38.6	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Thallium	1.70 - 2.50	2 / 9	0.060	0.080	CAA08-SS01-1008	0.86	0.46	1.15	0.59	1.00	0 / 9	0.08	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	9 / 9	10.8	28.9	CAA08-SS07-1008	19.3	6.93	23.6	18.2	130	0 / 9	0.22	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	9 / 9	8.50	160	CAA08-SS04-1008	41.3	47.4	70.7	27.7	120	1 / 9	1.33	26.5	4 / 9	6.04	**YES**	0.59	0.34	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	9 / 9	3,400	45,000	CAA08-SS04-1008	16,578	11,875	23,939	13,534	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	9 / 9	5.30	8.10	CAA08-SS07-1008	6.77	0.95	7.36	6.71	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE B-51
Exceedances - AOC 8 Surface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Soil Screening Value**	**95% UTL**	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID			CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008	CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date			10/22/08	10/22/08	10/22/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Volatile Organic Compounds (UG/KG)													
Acetone	--	--	3.0 B	**36 J**	11 U	11 U	10 U	3.0 B	12 U	11 U	3.0 B	3.0 B	3.0 B
Semivolatile Organic Compounds (UG/KG)													
Benzaldehyde	--	--	360 U	370 U	370 U	**180 J**	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Benzo(b)fluoranthene	HMW PAH	--	360 U	370 U	370 U	**290 J**	360 U	410 U	400 U	360 U	**270 J**	360 U	360 U
Benzo(k)fluoranthene	HMW PAH	--	360 U	370 U	370 U	**210 J**	360 U	410 U	400 U	360 U	**210 J**	360 U	360 U
Chrysene	HMW PAH	--	360 U	370 U	370 U	**210 J**	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Fluoranthene	LMW PAH	--	360 U	370 U	370 U	**260 J**	360 U	410 U	400 U	360 U	380 U	360 U	360 U
PAH (HMW)	18,000	--	1,620 U	1,665 U	1,665 U	**1,860**	1,620 U	1,845 U	1,800 U	1,620 U	**1,810**	1,620 U	1,620 U
PAH (LMW)	29,000	--	1,620 U	1,665 U	1,665 U	**1,700**	1,620 U	1,845 U	1,800 U	1,620 U	**1,710**	1,620 U	1,620 U
Pyrene	HMW PAH	--	360 U	370 U	370 U	**250 J**	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	583	--	3.6 U	3.6 U	**0.23 J**	**2.4 J**	**0.37 J**	3.8 U	3.8 U	3.7 U	**0.92 J**	3.6 U	3.6 U
4,4'-DDE	114	--	3.6 U	3.6 U	**0.34 J**	**4.8 J**	**17.0**	**0.31 J**	**0.64 J**	**1.3 J**	**2.0 J**	3.6 U	3.6 U
4,4'-DDT	100	--	**0.44 J**	3.6 U	**1.2 J**	7.3 U	**14.0**	3.8 U	3.8 U	**2.3 J**	**7.1 J**	3.6 U	3.6 U
Aroclor-1260	8,000	--	36 U	36 U	38 U	**420**	36 U	**110 J**	**190**	37 U	**180**	36 U	36 U
Dieldrin	10.5	--	**0.29 J**	3.6 U	**0.34 J**	7.3 U	3.6 U	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
Endrin aldehyde	1.95	--	3.6 U	3.6 U	**0.43 J**	**21.0 J**	3.6 U	**4.2 J**	**8.2 J**	**0.33 J**	**12 J**	3.6 U	3.6 U
Heptachlor epoxide	52.9	--	1.8 U	1.8 U	1.9 U	**0.76 J**	1.8 U	1.9 U	1.9 U	1.9 U	2.0 U	1.8 U	1.8 U
gamma-Chlordane	11.0	--	1.8 U	1.8 U	1.9 U	**0.81 J**	1.8 U	1.9 U	1.9 U	1.9 U	2.0 U	1.8 U	1.8 U
Explosives (UG/KG)													
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)													
Aluminum	pH < 5.5	12,200	**7,900**	**3,870**	**6,760**	**11,600**	**9,290**	**4,260**	**8,970**	**10,300**	**9,400**	**7,810**	**8,380**
Antimony	78.0	11.0	5.2 R	5.4 R	5.4 R	**1.7 L**	5.5 R	5.1 R	4.9 R	6.4 R	**0.71 L**	5.7 UL	4.3 UL
Arsenic	18.0	6.36	**3.3 K**	**2.4 K**	**3.7 K**	**15.4 K**	**3.2 K**	**1.8 K**	**3.0 K**	**3.5 K**	**9.1 K**	**2.4 L**	**2.5 L**
Barium	330	52.9	**32.6**	**12.1 J**	**32.4**	**69.1**	**16.1 J**	**8.1 J**	**19.5**	**68.4**	**47.6**	**42.3**	**45.0**
Beryllium	40.0	0.587	**0.33 J**	**0.20 J**	**0.32 J**	**0.55**	**0.29 J**	**0.35 J**	**0.40 J**	**0.47 J**	**0.37 J**	**0.48 J**	**0.48**
Cadmium	32.0	1.50	**0.09 J**	**0.08 J**	**0.11 J**	**0.71**	**0.09 J**	**0.12 J**	**0.17 J**	**0.14 J**	**0.38 J**	0.03 B	0.36 U
Chromium	64.0	18.2	**11.0**	**7.7**	**9.4**	**26.5**	**13.9**	**18.7**	**20.5**	**20.6**	**16.8**	**7.6 K**	**8.1 K**
Cobalt	13.0	9.93	**1.3 J**	**0.72 J**	**1.3 J**	**2.8 J**	**1.3 J**	**1.7 J**	**2.0 J**	**3.3 J**	**1.8 J**	**2.5 J**	**2.5 J**
Copper	70.0	4.25	**4.2**	**2.0 J**	**6.0**	**40.3**	**2.8**	**2.6**	**4.1**	**7.3**	**21.4**	**3.6**	**3.6**
Iron	5 < pH > 8	19,900	**7,950**	**5,020**	**7,760**	**15,800**	**9,320**	**6,560**	**9,690**	**12,300**	**9,000**	**4,980**	**6,330**
Lead	120	17.4	**21.3**	**8.8**	**18.7**	**60.7**	**6.4**	**3.0 J**	**9.6 J**	**10.6**	**39.4**	**17.4**	**17.6**
Manganese	220	324	**59.6 L**	**23.3 L**	**59.6 L**	**170 L**	**24.0 L**	**17.6 L**	**24.4 L**	**144 L**	**72.3 L**	**106 L**	**110 L**
Mercury	0.10	0.111	0.09 UL	0.084 UL	0.11 UL	**0.04 L**	0.11 UL	0.098 UL	0.13 UL	0.10 UL	0.12 UL	0.11 UL	0.11 UL
Nickel	38.0	9.52	**3.7**	**1.7 J**	**3.4 J**	**8.0**	**3.6 J**	**4.5**	**5.3**	**8.3**	**5.4**	**4.0**	**4.2**
Selenium	0.52	0.51	3.0 U	3.1 U	3.2 U	**0.60 J**	3.2 U	3.0 U	2.9 U	3.8 U	2.8 U	3.3 U	2.5 U
Thallium	1.00	--	**0.08 J**	2.5 U	2.1 U	2.2 U	**0.06 J**	2.2 U	2.2 U	2.1 U	1.7 U	2.4 U	1.8 U
Vanadium	130	27.9	**15.3**	**10.8**	**13.0**	**26.3**	**21.2**	**19.0**	**27.4**	**28.9**	**17.9**	**11.8**	**12.7**
Zinc	120	26.5	**18.0**	**8.5**	**31.8**	**160**	**12.3**	**11.5**	**19.0**	**25.8**	**64.4**	**25.8**	**31.8**
Other Parameters													
Total organic carbon (MG/KG)	--	--	**21,000 K**	**12,000 K**	**9,800 K**	**45,000 K**	**12,000 K**	**3,400 K**	NA	**12,000 K**	**14,000 K**	**20,000**	NA
pH	--	--	**6.3**	**5.3**	**6.6**	**7.9**	**6.9**	**6.4**	NA	**8.1**	**7.6**	**5.8**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-52
Ecological Screening Statistics - AOC 8 Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?
Volatile Organic Compounds (UG/KG)																			
2-Butanone	10.0 - 12.0	1 / 9	2.00	2.00	CAA08-SB06-1008	5.17	1.25	5.94	4.95	NSV	-- / --	NSV	--	-- / --	--	**YES**	NSV	NSV	**NO**
Pesticide/Polychlorinated Biphenyls (UG/KG)																			
4,4'-DDD	3.50 - 7.20	2 / 9	1.30	4.00	CAA08-SB07-1008	2.24	0.92	2.81	2.10	583	0 / 9	0.01	--	-- / --	--	NO	--	--	NO
4,4'-DDE	3.50 - 4.10	5 / 9	0.34	7.80	CAA08-SB07-1008	3.02	2.72	4.71	1.92	114	0 / 9	0.07	--	-- / --	--	NO	--	--	NO
4,4'-DDT	3.50 - 4.10	5 / 9	0.48	24.0	CAA08-SB04-1008	5.40	7.96	10.3	2.43	100	0 / 9	0.24	--	-- / --	--	NO	--	--	NO
Aroclor-1260	35.0 - 41.0	1 / 9	500	500	CAA08-SB04-1008	72.1	160	172	26.7	8,000	0 / 9	0.06	--	-- / --	--	NO	--	--	NO
Dieldrin	3.50 - 7.20	1 / 9	0.35	0.35	CAA08-SB03-1008	1.88	0.82	2.39	1.66	10.5	0 / 9	0.03	--	-- / --	--	NO	--	--	NO
Endrin	3.50 - 7.20	1 / 9	0.50	0.50	CAA08-SB06-1008	1.88	0.79	2.37	1.71	1.95	0 / 9	0.26	--	-- / --	--	NO	--	--	NO
Endrin aldehyde	3.50 - 4.10	4 / 9	0.36	24.0	CAA08-SB04-1008	3.99	7.52	8.66	1.82	1.95	1 / 9	12.3	--	-- / --	--	**YES**	4.44	2.05	**YES**
Heptachlor epoxide	1.80 - 2.00	1 / 9	1.70	1.70	CAA08-SB04-1008	1.02	0.26	1.18	1.00	52.9	0 / 9	0.03	--	-- / --	--	NO	--	--	NO
alpha-BHC	1.80 - 2.00	1 / 9	0.81	0.81	CAA08-SB04-1008	0.92	0.059	0.96	0.92	226	0 / 9	0.004	--	-- / --	--	NO	--	--	NO
Inorganics (MG/KG)																			
Aluminum	-- - --	9 / 9	4,890	9,820	CAA08-SB01-1008	7,548	1,841	8,689	7,333	pH < 5.5	1 / 9	--	13,000	0 / 9	0.76	NO	--	--	NO
Antimony	3.90 - 5.00	1 / 3	0.33	0.33	CAA08-SB04-1008	1.59	1.13	3.50	1.17	78.0	0 / 3	0.004	--	-- / --	--	NO	--	--	NO
Arsenic	-- - --	9 / 9	2.10	6.70	CAA08-SB04-1008	3.72	1.46	4.62	3.50	18.0	0 / 9	0.37	--	-- / --	--	NO	--	--	NO
Barium	-- - --	9 / 9	8.10	46.9	CAA08-SB09-1008	28.8	14.5	37.7	24.3	330	0 / 9	0.14	--	-- / --	--	NO	--	--	NO
Beryllium	-- - --	9 / 9	0.28	0.46	CAA08-SB04-1008	0.37	0.062	0.41	0.36	40.0	0 / 9	0.01	--	-- / --	--	NO	--	--	NO
Cadmium	0.040 - 0.41	5 / 9	0.060	0.45	CAA08-SB04-1008	0.18	0.16	0.28	0.11	32.0	0 / 9	0.01	--	-- / --	--	NO	--	--	NO
Calcium [2]	-- - --	9 / 9	331	11,100	CAA08-SB05-1008	2,923	4,006	5,406	1,185	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Chromium	-- - --	9 / 9	7.60	25.8	CAA08-SB07-1008	15.1	5.22	18.3	14.3	64.0	0 / 9	0.40	--	-- / --	--	NO	--	--	NO
Cobalt	-- - --	9 / 9	0.63	2.70	CAA08-SB06-1008	1.80	0.63	2.19	1.68	13.0	0 / 9	0.21	--	-- / --	--	NO	--	--	NO
Copper	-- - --	9 / 9	1.60	13.2	CAA08-SB04-1008	4.37	3.64	6.62	3.49	70.0	0 / 9	0.19	--	-- / --	--	NO	--	--	NO
Iron	-- - --	9 / 9	4,700	10,100	CAA08-SB04-1008	7,918	1,734	8,992	7,733	5 < pH > 8	2 / 9	--	32,000	0 / 9	0.32	NO	--	--	NO
Lead	-- - --	9 / 9	2.70	43.1	CAA08-SB04-1008	13.6	12.6	21.5	9.56	120	0 / 9	0.36	--	-- / --	--	NO	--	--	NO
Magnesium [2]	-- - --	9 / 9	510	1,770	CAA08-SB04-1008	1,017	442	1,291	942	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Manganese	-- - --	9 / 9	13.3	112	CAA08-SB04-1008	54.4	32.2	74.4	44.8	220	0 / 9	0.51	--	-- / --	--	NO	--	--	NO
Mercury	0.088 - 0.13	1 / 9	0.040	0.040	CAA08-SB04-1008	0.050	0.0074	0.055	0.050	0.10	0 / 9	0.40	--	-- / --	--	NO	--	--	NO
Nickel	-- - --	9 / 9	2.00	9.30	CAA08-SB07-1008	5.00	2.17	6.34	4.59	38.0	0 / 9	0.24	--	-- / --	--	NO	--	--	NO
Potassium [2]	-- - --	9 / 9	341	1,660	CAA08-SB02-1008	1,057	456	1,339	953	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Selenium	2.30 - 4.00	1 / 9	0.29	0.29	CAA08-SB05-1008	1.36	0.50	1.67	1.22	0.52	0 / 9	0.56	--	-- / --	--	NO	--	--	NO
Silver	0.66 - 1.20	1 / 9	0.040	0.040	CAA08-SB01-1008	0.39	0.16	0.48	0.33	560	0 / 9	0.0001	--	-- / --	--	NO	--	--	NO
Sodium [2]	-- - --	9 / 9	17.4	159	CAA08-SB05-1008	49.9	45.0	77.8	38.4	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO
Vanadium	-- - --	9 / 9	10.7	22.6	CAA08-SB07-1008	17.8	3.34	19.9	17.5	130	0 / 9	0.17	--	-- / --	--	NO	--	--	NO
Zinc	-- - --	9 / 9	7.80	88.8	CAA08-SB04-1008	23.5	24.8	38.9	18.0	120	0 / 9	0.74	--	-- / --	--	NO	--	--	NO
Other Parameters																			
Total organic carbon (MG/KG)	-- - --	9 / 9	800	35,000	CAA08-SB04-1008	9,233	10,291	15,612	5,498	--	-- / --	--	--	-- / --	--	--	--	--	--
pH	-- - --	9 / 9	5.20	8.60	CAA08-SB07-1008	6.80	1.21	7.55	6.71	--	-- / --	--	--	-- / --	--	--	--	--	--

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE B-53
Exceedances - AOC 8 Subsurface Soil
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	Eco Soil Screening Value	95% UTL	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID			CAA08-SB01-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SB04-1008	CAA08-SB05-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008	CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date			10/22/08	10/22/08	10/22/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Volatile Organic Compounds (UG/KG)													
2-Butanone	--	--	12 U	11 U	12 U	11 U	10 U	**2.0 J**	12 U	12 U	11 U	10 U	10 U
Semivolatile Organic Compounds (UG/KG)													
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/KG)													
4,4'-DDD	583	--	3.5 U	4.1 U	3.7 U	7.2 U	**1.3 J**	4.0 U	4.0 U	**4.0**	3.7 U	3.5 U	3.5 U
4,4'-DDE	114	--	3.5 U	4.1 U	**0.38 J**	**4.5 J**	**6.8**	**0.34 J**	4.0 U	**7.8**	3.7 U	3.5 U	3.5 U
4,4'-DDT	100	--	3.5 U	4.1 U	**0.48 J**	**24 J**	**3.0 J**	4.0 U	4.0 U	**13.0**	**0.53 J**	3.5 U	3.5 U
Aroclor-1260	8,000	--	35 U	41 U	37 U	**500 J**	35 U	40 U	40 U	37 U	37 U	35 U	35 U
Dieldrin	10.5	--	3.5 U	4.1 U	**0.35 J**	7.2 U	3.5 U	4.0 U	4.0 U	3.7 U	3.7 U	3.5 U	3.5 U
Endrin	1.95	--	3.5 U	4.1 U	3.7 U	7.2 U	3.5 U	**0.5 J**	4.0 U	3.7 U	3.7 U	3.5 U	3.5 U
Endrin aldehyde	1.95	--	3.5 U	4.1 U	**0.36 J**	**24 J**	3.5 U	**1.7 J**	**0.51 J**	3.7 U	**0.72 J**	3.5 U	3.5 U
Heptachlor epoxide	52.9	--	1.8 U	2.0 U	1.9 U	**1.7 J**	1.8 U	2.0 U	2.0 U	1.9 U	1.8 U	1.8 U	1.8 U
alpha-BHC	226	--	1.8 U	2.0 U	1.9 U	**0.81 J**	1.8 U	2.0 U	2.0 U	1.9 U	1.8 U	1.8 U	1.8 U
Explosives (UG/KG)													
No Detections	--	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Inorganics (MG/KG)													
Aluminum	pH < 5.5	13,000	**9,820**	**5,410**	**9,610**	**7,970**	**5,630**	**4,140**	**4,890**	**8,870**	**8,230**	**7,500**	**7,480**
Antimony	78.0	--	3.9 R	4.1 R	6.9 R	**0.33 L**	4.2 R	5.5 R	5.1 R	5 UL	5.5 R	3.3 UL	3.9 UL
Arsenic	18.0	5.54	**3.0 K**	**5.0 K**	**3.7 K**	**6.7 K**	**2.7 K**	**1.5 K**	**2.4 K**	**4.4 L**	**3.5 K**	**1.8 L**	**2.1 L**
Barium	330	84.5	**35.7**	**8.1 J**	**35.4**	**38.7**	**14.4**	**8.5 J**	**9.2 J**	**40.5**	**30.1**	**41.8**	**46.9**
Beryllium	40.0	0.52	**0.31 J**	**0.28 J**	**0.42 J**	**0.46 J**	**0.42**	**0.36 J**	**0.37 J**	**0.32 J**	**0.32 J**	**0.35**	**0.40**
Cadmium	32.0	--	**0.06 J**	0.04 B	**0.1 J**	**0.45 J**	**0.44**	**0.1 J**	**0.12 J**	0.41 U	0.06 B	0.27 U	0.33 U
Chromium	64.0	33.7	**11.5**	**15.7**	**14.7**	**15.8**	**14.8**	**15.9**	**19.0**	**25.8 K**	**10.9**	**7.4 K**	**7.6 K**
Cobalt	13.0	5.18	**1.4 J**	**0.63 J**	**1.6 J**	**2.3 J**	**1.8 J**	**1.6 J**	**2.7 J**	**2.3 J**	**1.4 J**	**1.8 J**	**2.1 J**
Copper	70.0	3.17	**3.7**	**1.9**	**3.9**	**13.2**	**2.3**	**2.2 J**	**2.0 J**	**6.5**	**4.0**	**1.6**	**1.6**
Iron	5 < pH > 8	32,000	**7,450**	**7,250**	**9,270**	**10,100**	**8,160**	**5,890**	**6,710**	**10,100**	**7,520**	**4,380**	**4,700**
Lead	120	8.79	**17.6**	**3.4**	**19.4**	**43.1**	**4.6**	**2.5**	**2.7**	**11.1**	**14.0**	**6.2**	**6.9**
Manganese	220	176	**50.7 L**	**13.3 L**	**65.0 L**	**112 L**	**31.0 L**	**16.0 L**	**18.7 L**	**84.1 L**	**42.2 L**	**59.0 L**	**72.5 L**
Mercury	0.10	0.14	0.10 UL	0.088 UL	0.09 UL	**0.04 L**	0.10 UL	0.12 UL	0.13 UL	0.10 UL	0.11 UL	0.10 UL	0.11 UL
Nickel	38.0	17.6	**4.2**	**2.0 J**	**4.6**	**5.6**	**5.2**	**5.3**	**7.1**	**9.3**	**3.5 J**	**3.3**	**3.5**
Selenium	0.52	0.64	2.3 U	2.4 U	4.0 U	3.6 U	**0.29 J**	3.2 U	3.0 U	2.9 U	3.2 U	1.9 U	2.3 U
Silver	560	1.10	**0.04 J**	0.69 U	1.2 U	1.0 U	0.70 U	0.91 U	0.86 U	0.82 U	0.92 U	0.54 U	0.66 U
Vanadium	130	48.3	**17.0**	**18.6**	**18.8**	**21.0**	**18.4**	**16.9**	**17.3**	**22.6**	**16.2**	**10.7**	**10.7**
Zinc	120	28.0	**15.2**	**7.8**	**20.5**	**88.8**	**15.1**	**10.6**	**15.8**	**21.0**	**16.4**	**10.6**	**11.2**
Other Parameters													
Total organic carbon (MG/KG)	--	--	**12,000 K**	**1,000 K**	**6,500 K**	**35,000 K**	**7,900 K**	**800 K**	NA	**7,300**	**4,500 K**	**8,100**	NA
pH	--	--	**6.3**	**5.7**	**6.6**	**7.3**	**8.4**	**5.2**	NA	**8.6**	**7.4**	**5.7**	NA

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

TABLE B-54
Ecological Screening Statistics - AOC 8 Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Geometric Mean	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient	95% UTL	Frequency of UTL Exceedance	Maximum Ratio to UTL	Initial COPC?	95% UCL Hazard Quotient	Mean Hazard Quotient	Refined COPC?	Refined COPC with DF of 10?
Volatile Organic Compounds (UG/L)																				
Tetrachloroethene	10.0 - 10.0	1 / 4	7.00	7.00	CAA08-DW02-1008	5.50	1.00	6.68	5.44	45.0	0 / 4	0.16	--	-- / --	--	NO	--	--	NO	NO
Inorganics (UG/L)																				
Aluminum	127 - 1,050	2 / 4	841	1,900	CAA08-DW02-1008	832	780	1,750	480	87.0	2 / 4	21.8	2,230	0 / 4	0.85	NO	--	--	NO	NO
Arsenic	4.30 - 10.1	1 / 4	14.6	14.6	CAA08-DW04-1008	6.15	5.77	12.9	4.59	36.0	0 / 4	0.41	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	12.7	20.6	CAA08-DW02-1008	16.3	3.31	20.2	16.1	200	0 / 4	0.10	--	-- / --	--	NO	--	--	NO	NO
Beryllium	5.00 - 5.00	1 / 4	0.18	0.18	CAA08-DW02-1008	1.92	1.16	3.28	1.30	100	0 / 4	0.002	--	-- / --	--	NO	--	--	NO	NO
Cadmium	0.19 - 0.52	2 / 4	0.85	1.10	CAA08-DW02-1008	0.58	0.48	1.14	0.39	8.85	0 / 4	0.12	--	-- / --	--	NO	--	--	NO	NO
Calcium [2]	-- - --	4 / 4	76,800	99,300	CAA08-DW01-1008	89,150	10,664	101,698	88,664	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Cobalt	3.00 - 3.00	3 / 4	1.10	5.80	CAA08-DW04-1008	3.20	2.27	5.87	2.55	23.0	0 / 4	0.25	--	-- / --	--	NO	--	--	NO	NO
Iron	433 - 3,270	1 / 4	8,300	8,300	CAA08-DW04-1008	2,750	3,745	7,157	1,257	1,000	1 / 4	8.30	894	1 / 4	9.28	**(NO)**	7.16	2.75	**(NO)**	NO
Lead	3.10 - 10.0	2 / 4	1.10	1.20	CAA08-DW03-1008	2.21	1.87	4.41	1.79	8.52	0 / 4	0.14	--	-- / --	--	NO	--	--	NO	NO
Magnesium [2]	-- - --	4 / 4	1,750	3,720	CAA08-DW04-1008	2,580	829	3,556	2,486	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	20.7	246	CAA08-DW04-1008	95.7	102	215	64.4	100	1 / 4	2.46	57.9	2 / 4	4.25	**(NO)**	2.15	0.96	NO	NO
Potassium [2]	-- - --	4 / 4	548	3,410	CAA08-DW04-1008	1,672	1,227	3,115	1,362	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Selenium	35.0 - 35.0	1 / 4	1.40	1.40	CAA08-DW01-1008	13.5	8.05	22.9	9.31	71.1	0 / 4	0.02	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	4 / 4	4,270	16,200	CAA08-DW04-1008	8,775	5,163	14,850	7,795	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Vanadium	0.62 - 3.60	1 / 4	8.20	8.20	CAA08-DW02-1008	3.00	3.53	7.16	1.67	50.0	0 / 4	0.16	--	-- / --	--	NO	--	--	NO	NO
Dissolved Metals (UG/L)																				
Aluminum	114 - 114	3 / 4	122	140	CAA08-DW04-1008	114	38.4	159	107	87.0	3 / 4	1.61	100	3 / 4	1.40	**YES**	1.82	1.30	**YES**	NO
Arsenic	4.40 - 4.60	1 / 4	13.8	13.8	CAA08-DW04-1008	5.14	5.78	11.9	3.54	36.0	0 / 4	0.38	--	-- / --	--	NO	--	--	NO	NO
Barium	-- - --	4 / 4	12.2	14.8	CAA08-DW04-1008	13.5	1.07	14.7	13.4	200	0 / 4	0.07	--	-- / --	--	NO	--	--	NO	NO
Calcium [2]	-- - --	4 / 4	76,400	99,500	CAA08-DW01-1008	88,075	10,008	99,851	87,645	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Chromium	10.0 - 10.0	3 / 4	0.41	0.76	CAA08-DW01-1008	1.67	2.22	4.29	0.94	50.0	0 / 4	0.02	--	-- / --	--	NO	--	--	NO	NO
Cobalt	-- - --	4 / 4	0.82	5.20	CAA08-DW04-1008	2.26	1.99	4.60	1.76	23.0	0 / 4	0.23	--	-- / --	--	NO	--	--	NO	NO
Copper	0.91 - 25.0	1 / 4	1.40	1.40	CAA08-DW04-1008	3.80	5.81	10.6	1.61	3.10	0 / 4	0.45	--	-- / --	--	NO	--	--	NO	NO
Iron	49.3 - 49.3	3 / 4	208	6,720	CAA08-DW04-1008	1,812	3,274	5,664	318	1,000	1 / 4	6.72	275	2 / 4	24.4	**YES**	5.66	1.81	**YES**	NO
Magnesium [2]	-- - --	4 / 4	1,280	3,550	CAA08-DW04-1008	2,370	929	3,463	2,226	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Manganese	-- - --	4 / 4	16.4	240	CAA08-DW04-1008	76.6	109	205	38.8	100	1 / 4	2.40	49.5	1 / 4	4.85	**YES**	2.05	0.77	NO	NO
Nickel	2.70 - 2.70	3 / 4	3.20	5.50	CAA08-DW02-1008	3.41	1.70	5.42	3.04	8.20	0 / 4	0.67	--	-- / --	--	NO	--	--	NO	NO
Potassium [2]	-- - --	4 / 4	584	3,140	CAA08-DW04-1008	1,377	1,185	2,771	1,098	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Sodium [2]	-- - --	4 / 4	4,280	15,900	CAA08-DW04-1008	8,673	5,031	14,592	7,729	NSV	-- / --	--	--	-- / --	--	NO	--	--	NO	NO
Thallium	1.60 - 25.0	1 / 4	1.90	1.90	CAA08-DW04-1008	6.93	6.45	14.5	3.93	21.3	0 / 4	0.09	--	-- / --	--	NO	--	--	NO	NO
Vanadium	50.0 - 50.0	3 / 4	0.54	0.64	CAA08-DW02-1008	6.68	12.2	21.1	1.47	50.0	0 / 4	0.01	--	-- / --	--	NO	--	--	NO	NO

NSV - No Screening Value
1 - Count of detected samples exceeding or equaling Screening Value
2 - Macronutrient - Not considered to be a COPC

TABLE B-55
Exceedances - AOC 8 Groundwater
WPNSTA Cheatham Annex
Williamsburg, Virginia

Station ID	**Eco Surface Water Screening Value - Marine**	**95% UTL Yorktown-Eastover**	CAA08-DW01	CAA08-DW02	CAA08-DW03	CAA08-DW04	
Sample ID			CAA08-DW01-1008	CAA08-DW02-1008	CAA08-DW03-1008	CAA08-DW04-1008	CAA08-DW04P-1008
Sample Date			10/28/08	10/28/08	10/27/08	10/27/08	10/27/08
Volatile Organic Compounds (UG/L)							
Tetrachloroethene	45.0	--	10 U	**7.0 J**	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/L)							
No Detections	--	--	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG/L)							
No Detections	--	--	NA	NA	NA	NA	NA
Explosives (UG/L)							
No Detections	--	--	NA	NA	NA	NA	NA
Inorganics (UG/L)							
Aluminum	87.0	2,230	1,050 B	**1,900**	127 B	**841**	**470**
Arsenic	36.0	2.28	5.6 B	10.1 B	4.3 B	**14.6**	13.9 B
Barium	200	118	**15.2 J**	**20.6 J**	**12.7 J**	**16.7 J**	**15.8 J**
Beryllium	100	2.45	5.0 U	**0.18 J**	5.0 U	5.0 U	5.0 U
Cadmium	8.85	0.605	0.19 B	**1.1 J**	0.52 B	**0.85 J**	0.67 B
Cobalt	23.0	20.6	**4.4 J**	3.0 B	**1.1 J**	**5.8 J**	**5.4 J**
Iron	1,000	894	1,700 B	3,270 B	433 B	**8,300**	**7,400**
Lead	8.52	21.3	10 U	3.1 B	**1.2 J**	**1.1 J**	10 U
Manganese	100	57.9	**55.8**	**60.4**	**20.7**	**246**	**238**
Selenium	71.1	--	**1.4 J**	35 U	35 U	35 U	35 U
Vanadium	50.0	26.2	3.6 B	**8.2 J**	0.62 B	3.4 B	2.0 B
Dissolved Metals (UG/L)							
Aluminum	87.0	100	**122 J**	**135 J**	114 B	**140 J**	**125 J**
Arsenic	36.0	1.37	4.5 B	4.4 B	4.6 B	**13.8**	12.4 B
Barium	200	127	**12.2 J**	**13.5 J**	**13.3 J**	**14.8 J**	**14.7 J**
Chromium	50.0	6.04	**0.76 J**	10 U	**0.51 J**	10 U	**0.41 J**
Cobalt	23.0	0.70	**1.5 J**	**1.5 J**	**0.82 J**	**5.2 J**	**5.2 J**
Copper	3.10	3.00	1.7 B	0.91 B	25 U	**1.4 J**	25 U
Iron	1,000	275	49.3 B	**208**	**295**	**6,650**	**6,720**
Manganese	100	49.5	**16.4**	**32.4**	**17.7**	**240**	**237**
Nickel	8.20	12.2	2.7 B	**5.5 J**	**3.6 J**	3.0 B	**3.2 J**
Thallium	21.3	--	25 U	1.6 B	25 U	**1.9 J**	25 U
Vanadium	50.0	4.30	50 U	**0.64 J**	**0.54 J**	**0.54 J**	**0.43 J**

Notes:

Grey highlighting indicates value greater than screening value

Yellow highlighting indicates value equal to screening value

Bold indicates detections

NA - Not analyzed

Equals or exceeds Background UTL

Appendix C
Boring Logs

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA01-SO01/DW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI
LOCATION Cheatham Annex
ELEVATION : Not Recorded
DRILLING CONTRACTOR : American Environmental Drilling
DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves
WATER LEVELS : 4' bgs
START : 11/03/08
END : 11/03/08
LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood and leaf organics, silty CLAY (OL) w/ some fine sand, moist, 2.5Y 3/1 very dark gray	None
1						
2						
3					**6"-5'-** sandy SILT (ML), wet @4', poorly graded, 2.5Y 5/2 grayish brn.	None
W.T. @ 4' 4						
5	1-5'	60"	1	NR	**End macrocore sampling @ 5'**	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA01-SO02/DW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9' bgs — START : 11/03/08 — END : 11/03/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood and leaf organics, silty CLAY (OL), some sand dry, 2.5Y 3/1 very dark gray, concrete debris	None
1						
2						
3						
4					**6"-9.5'-** sandy CLAY (CL), moist, poorly graded, stiff, 2.5Y 5/6 lt. olive brown	None
5	1-5'	60"	1	NR		
6						
7						
8						
W.T. @ 9' 9						
10	5'-10'	54"	2	NR		
					End macrocore sampling @ 10'	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA01-SO03/DW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 32' bgs — START : 11/04/08 — END : 11/04/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
					0'-6"- Topsoil w/ grass and leaf organics, sandy SILT (SM), dry, 2.5Y 4/3 olive brown, pebbles from asphalt road	None
5	1-5'	60"	1	NR	**6"-7'-** sandy SILT (ML), w/ some clay lenses, dry, poorly graded, 2.5Y 5/2 grayish brown	None
10	5'-10'	60"	2	NR	**7'-11'-** sandy SILT (ML), dry, poorly graded, 2.5Y 6/6 olive yellow	None
					11'-13'- sandy SILT (ML), dry, poorly graded, 2.5Y 6/2 lt. brnish gray	None
15	10'-15'	60"	3	NR		
20	15'-20'	60"	4	NR	**13'-30'-** silty CLAY (CL), moist, poorly graded, varies between soft and medium stiff and 2.5Y 6/6 olive yellow and 2.5Y 6/4 lt. yellowish brown	None
25	20'-25'	60"	5	NR		
30	25'-30'	60"	6	NR		
W.T. @ 32'					**30'-35'-** SAND (SP), fine, poorly graded with shell hash, 2.5Y 6/6 olive yellow, moist to wet @ 32'	None
35	30'-35'	60"	7	NR		
					End macrocore sampling @ 35'	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA01-SO10/DW04	SHEET OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI LOCATION Cheatham Annex
ELEVATION : Not Recorded DRILLING CONTRACTOR : American Environmental Drilling
DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves
WATER LEVELS : 28' bgs START : 11/05/08 END : 11/05/08 LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
					0'-3"- Topsoil w/ grass, wood, & leaf organics, silty SAND (SP), dry, 2.5Y 3/2 v. dark grayish brown	None
					3"-1.5'- silty CLAY (OL), w/ organics (roots), stiff, moist, 10YR 6/8 brownish yellow	None
					1.5'-3.5'- gravel with sandy CLAY (ML), clay has black staining and iron mottling	Concrete debris encountered in interval
					3.5'-4'- DEBRIS- asphalt-like, leaves greasy residue, 2.5Y 2.5/1 black	Asphalt-like debris encountered
5	1-5'	60"	1	NR	**4'-11'-** silty, sandy CLAY (CL), stiff to medium stiff, poorly graded, dry, 2.5Y 6/6 olive yellow	None
10	5'-10'	60"	2	NR		
15	10'-15'	60"	3	NR	**11'-18'-** CLAY (CL), medium stiff, moist, 2.5Y 5/3 lt. olive brown with iron mottling	None
20	15'-20'	60"	4	NR	**18'-28'-** silty CLAY (CL), soft, moist, color changes from 2.5Y 5/3 lt. olive brown to 2.5Y 6/8 olive yellow	None
25	20'-25'	60"	5	NR		
W.T. @ 28'						
30	25'-30'	60"	6	NR	**28'-30'-** SAND (SP), fine, poorly graded with gravels and organics, wet @ 28', 2.5Y 5/3 lt. olive brown	None
					End macrocore sampling @ 30'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA01-SO18/DW05	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI
LOCATION Cheatham Annex
ELEVATION : Not Recorded
DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : 5' Hand auger
WATER LEVELS : 5' bgs
START : 12/18/08
END : 12/18/08
LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood & leaf organics, silty CLAY (OL), moist, 2.5Y 3/1 v. dk. gray, metal shards throughout	None
1						
2					**6"-5'-** silty, clayey SAND (SP), moist to wet at 5', poorly graded, med. dense, 2.5Y 5/6 lt. olive brown	None
3						
4						
W.T. @ 5' 5	1-5'	60"	1	NR		
					End macrocore sampling @ 5'	

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA01-SO19/DW06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI LOCATION Cheatham Annex
ELEVATION : Not Recorded DRILLING CONTRACTOR : Parratt Wolff
DRILLING METHOD AND EQUIPMENT USED : 5' Hand auger
WATER LEVELS : 4' bgs START : 12/18/08 END : 12/18/08 LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood, & leaf organics, silty, sandy CLAY (OL), moist, poorly graded, 2.5Y 3/1 v. dk. gray	None
					6"-10"- friable, laminated shaly layer, v. fine compacted silt, moist, 5GY 7/1 lt. greenish gray	None
1						
2					**10"- 5'-** sandy SILT (ML), wet at 4', loose, poorly graded, 2.5Y 5/2 grayish brown	None
3						
W.T. @ 4' 4						
5	1-5'	60"	1	NR		
					End macrocore sampling @ 5'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA01-SO17/DW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : Parratt Wolff

DRILLING METHOD AND EQUIPMENT USED : Grab Sampler tool using 4' Acetate sleeves; penetrated with tripod

WATER LEVELS : 5' bgs — START : 12/17/08 — END : 12/18/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-8"-** Topsoil w/ wood, & leaf organics, moist, 10YR 2/2 v. dk. brown	None
1						
2					**8"-4'-** SAND (SW), dense, well graded fine to coarse sand w/ gravels, moist to v. moist at 4', color varies from 2.5Y 6/6 olive yellow to 2.5Y 7/1 lt. gray to 2.5Y 3/1 v. dk. gray	None
3						
4	1-4'	48"	1	NR		
W.T. @ 5' 5					**4'-6'-** No Recovery	None
6					**6'-7'-** SAND (SW), med. dense, well graded fine to coarse sand w/ gravels, 2.5Y 5/2 grayish brown	None
7					**7'-8'-** silty SAND (SP), wet, fine grained, poorly sorted, 2.5Y 6/2 lt. brownish gray	None
8	4'-8'	24"	2	NR		
9						
10						
11						
12	8'-12'	48"	3	NR	**8'-16'-** CLAY (CL), v. stiff, moist, 5 GY 4/1 dk. greenish gray	None
13						
14						
15						
16	12'-16'	48"	4	NR		
					End macrocore sampling @ 16'	

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO07/DW01	SHEET OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI LOCATION Cheatham Annex

ELEVATION : Not Recorded DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9.5' bgs START : 11/05/08 END : 11/05/09 LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ leaf and wood organics, sandy SILT (OL), dry, 2.5Y 3/2 v. dark grayish brown	None
1						
2						
3					**3"-5'-** sandy SILT (ML), dry, poorly graded, 2.5Y 5/6 lt. olive brown	None
4						
5	1-5'	60"	1	NR		
6						
7					**5'-9.5'-** SAND (SP), moist, loose, poorly graded, fine to med grained 10YR 5/6 yellowish brown	None
8						
9						
W.T. @ 9.5-10'						
10	5'-10'	60"	2	NR	**9.5'-10'-** silty SAND (SP), wet, loose, poorly graded, 2.5Y 3/2 v. dark grayish brow	None
					End macrocore sampling @ 10'	

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO11/DW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 11' bgs — START : 11/06/08 — END : 11/06/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood, root & leaf organics, sandy SILT (OL), moist, loose, poorly graded, 2.5Y 3/2 v. dark grayish brown	None
1					**6"-1.5'-** sandy SILT (OL) w/ organics, med. stiff, moist, poorly graded, 2.5Y 6./3 lt. yellowish brown	None
2						
3					**1.5'-5'-** sandy SILT (ML), stiff, poorly graded, 2.5Y 6/6 olive ye	None
4						
5	1-5'	60"	1	NR		
6					**5'-7.5'-** sandy, silty CLAY (CL), moist, soft to med. stiff, poorly graded, 2.5Y 5/3 lt. olive brown	None
7						
8						
9					**7.5'-11'-** silty CLAY (CL), moist, stiff to v. stiff, poorly graded, color changes from 2.5Y 7/1 lt. gray to 2.5Y 5/6 lt. olive brown	None
10	5'-10'	60"	2	NR		
11						
W.T. @ ~11.5'					**11'-11.5'-** sandy SILT (OL) organic layer w/ wood, v. moist, poorly graded, 2.5Y 3/1 v. dark gray	None
12					**11.5'-12'-** sandy SILT (ML), wet, poorly graded, 2.5Y 7/4 pale yellow	None
13					**12'-15'-** SAND (SW), wet, loose, well graded, fine to coarse grained (coarsens downward) 2.5Y 6/6 olive yellow with color change to 2.5Y 4/3 olive brown	None
14						
15	10'-15'	60"	3	NR		
					End macrocore sampling @ 15'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO10/DW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 8' bgs — START : 11/06/08 — END : 11/06/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-4"-** Topsoil w/ wood, grass & root organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dark grayish brown	None
1, 2, 3					**4"-3'-** sandy SILT (OL) with some organics, loose, moist, heavily mottled, 2.5Y 5/1 gray	None
4, 5	1-5'	60"	1	NR	**3'-5'-** sandy, silty CLAY (CL), moist, soft to med. stiff, heavily mottled, 2.5Y 5/1 gray	None
6, 7					**5'-7'-** SAND (SP), fine grained, moist, poorly graded, 2.5Y 5/2 grayish brown	None
W.T. @ 8' 8					**7'-8'-**silty CLAY (CL), moist, stiff, 2.5Y 7/1 lt. gray (mottled w/ 2.5Y 5/6 lt. olive brown)	None
9, 10	5'-10'	60"	2	NR	**8'-10'-** SAND (SM), wet, fine to med. grained, loose, well graded, 2.5Y 6/6 olive yellow color changes to 2.5Y 4/3 olive brown, coarsens downward	None
					End macrocore sampling @ 10'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO12/DW04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 10' bgs — START : 11/06/08 — END : 11/06/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood, root & leaf organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dark grayish brown	None
1						
2					**6"-5'-** sandy SILT (ML), soft to med stiff, moist, poorly graded, 2.5Y 6/8 olive yellow	None
3						
4						
5	1-5'	60"	1	NR		
					5'-6'- sandy, silty CLAY (CL), moist, soft to med. stiff, poorly graded, iron and dark mottling, 2.5Y 5/3 lt. olive brown	None
6						
7						
8					**6'-10'-** silty CLAY (CL), moist, v. stiff, 2.5Y 7/1 lt. gray w/ iron mottling	None
9						
W.T. @ 10' 10	5'-10'	60"	2	NR		
11					**10'-13'-** SAND (SM), wet, fine to med. grained, loose, well graded, 2.5Y 5/6 olive yellow, coarsens downward	None
12						
13						
14					**13'-15'-** silty CLAY (CL), stiff, wet, 2.5Y 7/1 lt. gray w/ iron mottling	None
15	10'-15'	60"	3	NR		
					End macrocore sampling @ 15'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO13/DW06	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI
LOCATION Cheatham Annex
ELEVATION : Not Recorded
DRILLING CONTRACTOR : American Environmental Drilling
DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves
WATER LEVELS : 8' bgs
START : 11/10/08
END : 11/10/08
LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ wood organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dark grayish brown	None
1						
2					**3"-5'-** sandy SILT (OL) w/ wood & root organics, loose to stiff, dry, poorly graded, 2.5Y 6/4 lt. yellowish brown with iron mottling	None
3						
4						
5	1-5'	60"	1	NR		
6					**5'-7'-** no recovery	None
7						
W.T. @ 8' 8					**7'-8'-** silty CLAY (CL), moist, soft to med. stiff, poorly graded, color changes from 2.5Y 7/1 lt. gray to 2.5Y 6/6 olive yellow due to mottling	None
9					**8'-10'-** SAND (SW), wet, fine to med. grained, loose, well graded, 2.5Y 6/6 olive yellow, coarsens downward	None
10	5'-10'	36"	2	NR		
					End macrocore sampling @ 10'	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA06-SO02/DW07	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9' bgs — START : 11/10/08 — END : 11/10/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ wood and leaf organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dark grayish brown	None
1, 2, 3, 4, 5, 6	1-5'	60"	1	NR	**3"-6'-** sandy SILT (OL) w/ wood & root organics, stiff, dry, poorly graded, 2.5Y 6/6 olive yellow	None
7, 8					**6'-8'-** silty SAND (SM), v. moist, loose to med. dense, well graded, med. to coarse sand 2.5Y 6/8 olive yellow	None
W.T. @ 9' 9					**8'-9.5'-** silty CLAY (CL), moist, poorly graded, soft to stiff at bottom, 2.5Y 7/1 lt gray to 2.5Y 6/8 olive yellow (from heavy iron mottling)	None
10	5'-10'	60"	2	NR	**9.5'-10'-** SAND (SW), wet, well graded, loose, 2.5Y 6/8 olive yellow with iron mottling	None
					End macrocore sampling @ 10'	

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO08/DW08	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI LOCATION Cheatham Annex

ELEVATION : Not Recorded DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9.5' bgs START : 11/10/08 END : 11/10/08 LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ wood and leaf organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dark grayish brown	None
1						
2						
3						
4						
5	1-5'	60"	1	NR	**3"-8'-** sandy SILT (OL) w/ root organics, v. stiff, dry to moist, poorly graded, 2.5Y 6/8 olive yellow	None
6						
7						
8						
9					**8'-9.5'-** silty CLAY (CL), moist, poorly graded, soft to stiff, color changes from 2.5Y 7/1 lt gray to 2.5Y 6/8 olive yellow	None
W.T. @ 9.5'						
10	5'-10'	60"	2	NR	**9.5'-10'-** SAND (SW), wet, well graded, loose, 2.5Y 6/8 olive yellow with iron mottling	None
					End macrocore sampling @ 10'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO15/DW09	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 11' bgs — START : 11/11/08 — END : 11/11/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ roots, sandy SILT (OL), moist, loose, poorly graded, 2.5Y 4/4 olive brown	None
1					**6"-1'**- above sandy SILT (OL) grades to loose sandy SILT (SM) with no organics 2.5Y 5/6 lt. olive brown	None
2					**1'-2'-** sandy SILT (ML), med. stiff to med. dense, sand is fine grained, poorly graded, 2.5Y 5/4 lt. olive brown changes from 2.5Y 7/1 lt gray to 2.5Y 6/8 olive yellow	None
3						
4						
5	1-5'	60"	1	NR	**2'-9'-** silty CLAY (CL), v. stiff, dry, poorly graded, v. stiff, poorly graded, color changes from 2.5Y 7/1 lt. gray to heavily mottled 2.5Y 6/8 olive yellow	None
6						
7						
8						
9						
10	5'-10'	60"	2	NR	**9'-10'-** sandy, silty shell HASH, loose, v. moist, 2.5Y 6/6 olive yellow	None
W.T. @ 11' 11						
12					**10'-15'-** 1' recovered. shell HASH, wet, 2.5Y 6/6 olive yellow	None
13						
14						
15	10'-15'	12"	3	NR		
					End macrocore sampling @ 15'	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA06-SO17/DW10	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 10.5' bgs — START : 11/11/08 — END : 11/11/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ roots, sandy SILT (OL), moist, loose, poorly graded, 2.5Y 4/4 olive brown	None
1					**6"-1'**- above sandy SILT (OL) grades to loose sandy SILT (SM) with no organics 2.5Y 5/6 lt. olive brown	None
2					**1'-2'-** sandy SILT (ML), med. stiff to med. dense, sand is fine grained, poorly graded, 2.5Y 5/4 lt. olive brown changes from 2.5Y 7/1 lt gray to 2.5Y 6/8 olive yellow	None
3						
4					**2'-9'-** silty CLAY (CL), v. stiff, dry, poorly graded, v. stiff, poorly graded, color changes from 2.5Y 7/1 lt. gray to heavily mottled 2.5Y 6/8 olive yellow	None
5	1-5'	60"	1	NR		
6						
7						
8						
9						
10	5'-10'	60"	2	NR	**9'-10'-** sandy, silty shell HASH, loose, v. moist, 2.5Y 7/4 pale yellow	None
W.T. @ 10.5' 11						
12						
13					**10'-15'-** 1' recovered. shell HASH, wet, 2.5Y 7/4 pale yellow	None
14						
15	10'-15'	12"	3	NR		
					End macrocore sampling @ 15'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA06-SO19/DW11	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI
LOCATION Cheatham Annex
ELEVATION : Not Recorded
DRILLING CONTRACTOR : American Environmental Drilling
DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves
WATER LEVELS : 10' bgs
START : 11/11/08
END : 11/11/08
LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ roots and construction gravel, sandy SILT (OL), dry, stiff, 2.5Y 4/4 olive brown	None
1					**6"-2'**- above sandy SILT (OL) grades to loose sandy SILT (ML) with some clay and brick shards, 2.5Y 4/4 olive brown	None
2						
3					**2'-5'-** silty CLAY (CL), stiff, dry, poorly graded, 2.5Y 6/8 olive yellow due to heavy mottling	None
4						
5	1-5'	60"	1	NR		
6					**5'-8'-** No recovery	None
7						
8						
9					**8'-9'-** sandy, shell HASH, loose, moist, 2.5Y 7/4 pale yellow	None
W.T. @ 10' 10	5'-10'	24"	2	NR	**9'-10'-** silty CLAY (CL), with shell hash, v. moist to wet, poorly graded, 2.5Y 7/4 pale yellow	None
					End macrocore sampling @ 10'	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA07-SO01/DW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 19' bgs — START : 10/29/08 — END : 10/29/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-4"-** Topsoil w/ leaf and wood organics, sandy SILT (OL), dry, stiff, 2.5Y 3/2 v. dark grayish brown	None
1						
2						
3					**4"-5'**- sandy SILT (ML) v. stiff, dry, poorly graded, 2.5Y 5/6 lt. olive brn	None
4						
5	1-5'	60"	1	NR		
					5'-6'- sandy CLAY (CL), v. stiff, dry, poorly graded, 2.5Y 5/6 lt. olive brn	None
6						
7					**6'-6.5'-** organic layer- woody debris, sandy SILT (OL), dry, poorly graded, 2.5Y 3/2 v. dk. grayish brown	None
8						
9					**6.5'-10'-** sandy SILT (ML) dry, med dense, iron mottles, 2.5Y 6/4 lt. yellowish brown	None
10	5'-10'	60"	2	NR		
11						
12					**10'-13'-** No recovery	None
13						
14					**13'-15'-** sandy SILT (ML), dry, loose, sand is fine grained, poorly graded, 2.5Y 6/6 olive yellow with iron mottling	None
15	10'-15'	24"	3	NR		
16					**15'-18'-** No recovery	None
17						
18						
W.T. @ 19' 19					**18'-20'-** SAND (SP), moist to wet, loose, fine grained, poorly graded, 2.5Y 6/6 olive yellow	None
20	15'-20'	24"	4	NR		
					End macrocore sampling @ 20'	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA07-SO05/DW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI LOCATION Cheatham Annex

ELEVATION : Not Recorded DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 20' bgs START : 10/30/08 END : 10/30/08 LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-4"-** Topsoil w/ leaf and wood organics, sandy SILT (OL), dry, stiff, 2.5Y 3/2 v. dark grayish brown	None
1, 2, 3, 4, 5	1-5'	60"	1	NR	**4"-5'**- sandy, clayey SILT (ML) v. stiff, dry, poorly graded, sand fine grained, 2.5Y 6/6 olive yellow	None
6, 7					**5'-7'-** No recovery	None
8					**7'-7.5'-** organic layer- woody debris, sandy SILT (OL), dry, poorly graded, 2.5Y 3/2 v. dk. grayish brown	None
9, 10, 11, 12, 13, 14, 15	5'-10' / 10'-15'	36" / 60"	2 / 3	NR / NR	**7.5'-15'-** silty SAND (SP), dry to moist, loose, medium grained, poorly graded color varies throughout from 2.5Y 6/4 lt. yellowish brown to 2.5Y 6/8 olive yellow	None
16, 17, 18, 19					**15'-19'-** No recovery	None
W.T. @ 20' 20	15'-20'	12"	4	NR	**19'-20'-** silty SAND (SP), dry to moist, loose, medium grained, poorly graded, color varies throughout from 2.5Y 6/4 lt. yellowish brown to 2.5Y 6/8 olive yellow	None
					End macrocore sampling @ 20'	

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA07-SO03/DW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI LOCATION Cheatham Annex

ELEVATION : Not Recorded DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 17.5' bgs START : 10/30/08 END : 10/30/08 LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ leaf and wood organics, sandy SILT (OL), dry, 2.5Y 3/2 v. dk grayish brown	
1						
2						
3					**3"-5'-** sandy, clayey SILT (ML) loose, dry, poorly graded, sand fine grained, 2.5Y 6/8 olive yellow	
4						
5	1-5'	60"	1	NR		
6					**5'-6'-** same as above except 2.5Y 6/4 lt. yellowish brown	
7						
8						
9					**6'-10'-** sandy, silty CLAY (CL, v. stiff, dry, sand fine grained, 2.5Y 6/6 olive yellow	
10	5'-10'	60"	2	NR	**10'-10.5'-** No recovery	
11					**10.5'-11'-** organic layer- woody debris with sandy SILT (OL), 2.5Y 3/2 v. dk. grayish brown	
12						
13						
14					**11'-20'-** silty SAND (SP), moist to wet, loose, poorly graded, color grades from 2.5Y 6/6 olive yellow to 10YR 4/6 dk. yellowish brwn	
15	10'-15'	54"	3	NR		
16						
17						
W.T. @ 17.5'						
18						
19						
20	15'-20'	60"	4	NR		
					End macrocore sampling @ 20'	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA07-SO04/DW04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9' bgs — START : 10/31/08 — END : 10/31/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-4"-** Topsoil w/ leaf and wood organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dk grayish brow	None
1					**4"-2'**- silty SAND (SP), loose, dry, poorly graded, fine grained, 10YR 4/6 dk. yellowish brown	None
2					**2'-2.5'-** SAND (SP), loose, dry, poorly graded, fined grained, 2.5Y 6/6 olive yellow	None
3						
4					**2.5'-5'-** No recovery	None
5	1-5'	30"	1	NR		
6						
7						
8					**5'-10'-** 1' of recovery; silty SAND (SP), loose, wet, poorly graded, 10YR 4/6 dk. Yellowish brown	None
W.T. @ 9' 9						
10	5'-10'	12"	2	NR	**End macrocore sampling @ 10'**	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA08-SO09/DW01	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 15' bgs — START : 10/29/08 — END : 10/29/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ wood organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dark grayish brown	None
1, 2, 3, 4, 5, 6, 7	1-5'	60"	1	NR	**3"-7'**- sandy SILT(ML), loose, dry, poorly graded, sand fine grained, 2.5Y 5/6 lt. olive brown	None
8, 9, 10, 11, 12, 13, 14	5'-10'	60"	2	NR	**7'-15'-** SAND (SP), loose, dry to wet at 15', poorly graded, fine grained, iron mottling causes color to range from 2.5Y 7/4 pale yellow to 2.5Y 6/6 olive yellow	None
W.T. @ 15' 15	10'-15'	60"	3	NR	**End macrocore sampling @ 15'**	

CH2MHILL	PROJECT NUMBER 358846.SI.SI	BORING NUMBER CAA08-SO08/DW02	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9.5' bgs — START : 10/28/08 — END : 10/28/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood organics, sandy SILT (OL), moist, 2.5Y 3/2 v. dk grayish brown	None
1, 2, 3, 4, 5, 6	1-5'	60"	1	NR	**6"-6'**- SAND (SP), loose, moist, poorly graded, sand fine grained, w/ black burnt wood and construction gravel, 2.5Y 5/4 lt. olive brown	None
7, 8, 9					**6'-9'**- SAND (SP), loose, moist, poorly graded, sand fine grained, sharp color change to 5GY 6/1 greenish gray	None
W.T. @ 9.5'					**9'-10'**- wet, otherwise same as above w/ color change to 2.5Y 6/6 olive yellow	None
10	5'-10'	60"	2	NR	**End macrocore sampling @ 10'**	

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA08-SO07/DW03	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI — LOCATION Cheatham Annex

ELEVATION : Not Recorded — DRILLING CONTRACTOR : American Environmental Drilling

DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves

WATER LEVELS : 9' bgs — START : 10/27/08 — END : 10/27/08 — LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-6"-** Topsoil w/ wood and leaf organics, sandy SILT (OL), moist, 2.5Y 3/3 dk olive brown	None
					6"-8"- construction gravel	None
1, 2, 3, 4					**8"-4'**- silty, sandy CLAY (CL), stiff, moist, poorly graded, sand fine grained, 2.5Y 5/6 lt. olive brown	None
5	1-5'	60"	1	NR	**4'-5'**- sandy, silty CLAY (OL) with organics, soft, dry, poorly graded, 2.5Y 1/1 black	petroleum odors
6					**5'-6'-** No recovery	None
7					**6'-7'**- sandy, silty CLAY (CL), soft, slightly moist, non-confining 2.5Y 3/3 dk. olive brown	None
8, W.T. @ 9' 9					**7'-10'**- SAND (SP), med. dense, poorly graded, moist to wet at ~9', fine grained, 5GY 6/1 greenish gray	None
10	5'-10'	48"	2	NR	**End macrocore sampling @ 10'**	

CH2MHILL

PROJECT NUMBER	BORING NUMBER	
358846.SI.SI	CAA08-SO06/DW04	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : 358846.SI.SI
LOCATION Cheatham Annex
ELEVATION : Not Recorded
DRILLING CONTRACTOR : American Environmental Drilling
DRILLING METHOD AND EQUIPMENT USED : DPT Grab Sampler tool using 5' Acetate sleeves
WATER LEVELS : 5' bgs
START : 10/27/08
END : 10/27/08
LOGGER : Carol Peterson

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY SOIL STRUCTURE, AND MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS AND INSTRUMENTATION.
0					**0'-3"-** Topsoil w/ organics, sandy SILT (OL), moist, 2.5Y 3/3 dark olive brown	None
1					**3"-2'**- silty SAND (SM), fine grained, dry, poorly graded, iron mottling 2.5Y 5/8 olive yellow	None
2						
3					**2'-7'**- same except 5Y 5/2 olive gray; W.T. @ ~5'	None
4						
W.T. @ 5' 5	1-5'	60"	1	NR		
6						
7						
8					**7'-9'**- sandy SILT (ML), no organics except sm. amount shell hash, sand is fine grained and poorly graded, wet, 2.5Y 6/6 olive yellow	None
9						
10	5'-10'	60"	2	NR	**9'-10'**- SAND (SP) with shell hash, fine grained, poorly graded, 2.5Y 6/4 lt. yellowish brown	None
					End macrocore sampling @ 10'	

Appendix D
IDW Analytical Results and Disposal Documentation

TABLE D-1
IDW Raw Analytical Data
Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

Sample ID	CAA01-WW01-121908	
Sample Date	12/19/08	
Chemical Name		
TCLP Volatile Organic Compounds (UG/L)		
1,1-Dichloroethene	100 U	NA
1,2-Dichloroethane	100 U	NA
1,4-Dichlorobenzene	100 U	NA
2-Butanone	100 U	NA
Benzene	100 U	NA
Carbon tetrachloride	100 U	NA
Chlorobenzene	100 U	NA
Chloroform	100 U	NA
Tetrachloroethene	100 U	NA
Trichloroethene	100 U	NA
Vinyl chloride	100 U	NA
TCLP Semivolatile Organic Compounds (UG/L)		
1,4-Dichlorobenzene	50 U	50 U
2,4,5-Trichlorophenol	50 U	50 U
2,4,6-Trichlorophenol	50 U	50 U
2,4-Dinitrotoluene	50 U	50 U
2-Methylphenol	50 U	50 U
4-Methylphenol	50 U	50 U
Hexachlorobenzene	50 U	50 U
Hexachlorobutadiene	50 U	50 U
Hexachloroethane	50 U	50 U
Nitrobenzene	50 U	50 U
Pentachlorophenol	100 U	100 U
Pyridine	50 U	50 U
TCLP Pesticides/Polychlorinated Biphenyls (UG/L)		
Chlordane	5 U	NA
Endrin	0.25 U	NA
Gamma-BHC (Lindane)	0.25 U	NA
Heptachlor	0.25 U	NA
Heptachlor Epoxide	0.25 U	NA
Methoxychlor	0.25 U	NA
Toxaphene	5 U	NA
TCLP Herbicides (UG/L)		
2,4,5-TP (Silvex)	1 U	NA
2,4-D	1 U	NA
TCLP Metals (UG/L)		
Arsenic	200 U	NA
Barium	1000 U	NA
Cadmium	60 U	NA
Chromium	50 U	NA
Lead	100 U	NA
Mercury	2 U	NA
Selenium	200 U	NA
Silver	50 U	NA
Reactivity, Corrosivity, Ignitability (DEG/C)		
Flash Point	100 U	NA
pH	7.1	NA
Reactive cyanide	0.03 U	NA
Reactive sulfide	10 U	NA

Notes:

DEG/C - Degrees centigrade
PH - pH units
NA - Not analyzed
UG/L - Micrograms per liter
UG/ML - Micrograms per milliliter

TABLE D-2
IDW Analytical Detection Results
Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

Sample ID	CAA01-WW01-121908	
Sample Date	12/19/08	
Chemical Name		
TCLP Volatile Organic Compounds (UG/L)		
No Detections		
TCLP Semivolatile Organic Compounds (UG/L)		
No Detections		
TCLP Pesticides/Polychlorinated Biphenyls (UG/L)		
No Detections		
TCLP Herbicides (UG/L)		
No Detections		
TCLP Metals (UG/L)		
No Detections		
Reactivity, Corrosivity, Ignitability (DEG/C)		
pH	7.1	NA

Notes:

DEG/C - Degrees centigrade
PH - pH units
NA - Not analyzed
UG/L - Micrograms per liter
UG/ML - Micrograms per milliliter
Shading indicates detection

Tracking #

WASTE CHARACTERIZATION REPORT

☒ ***I authorize EQ – The Environmental Quality Company to choose the appropriate method of waste management, from the technologies offered, at the EQ facilities identified below.***

☐ **Michigan Disposal Waste Treatment Plant** (Stabilization and Treatment)	49350 N. I-94 Service Drive, Belleville, MI 48111 Phone: 800-592-5489 Fax: 800-592-5329	EPA ID # MID 000 724 831
☐ **Wayne Disposal, Inc. Site #2 Landfill** (Hazardous & Chemical Waste Landfill)	49350 N. I-94 Service Drive, Belleville, MI 48111 Phone: 800-592-5489 Fax: 800-592-5329	EPA ID # MID 048 090 633
☐ **EQ Detroit, Inc.** (Stabilization, Wastewater Treatment)	1923 Frederick Street, Detroit, MI 48211 Phone: (313) 923-0080 Fax: 313-923-3375	EPA ID # MID 980 991 566
☐ **EQ Resource Recovery, Inc.** (Solvent Recycling, Fuel Blending, WW Treatment)	36345 Van Born Road, Romulus, MI 48174 Phone: 866-373-8357 Fax: 734-326-4033	EPA ID # MID 060 975 844
☐ **EQ North Carolina** (Stabilization, Treatment, Labpack Decommissioning)	1005 Investment Blvd, Apex, NC 27502 Phone: 919-363-4700 Fax: 919-363-4714	EPA ID # NCD 982 170 292
☒ **EQ Florida, Inc.** (Drum Consolidation, Labpack Decommissioning)	7202 East 8th Ave, Tampa, FL 33619 Phone: 813-623-5463 Fax: 813-628-0842	EPA ID # FLD 981 932 494
☐ **EQ Transfer & Processing** (Drum Transfer/Non-Hazardous Waste Processing)	1010 Old Rawsonville Rd., Ypsilanti, MI 48198 Phone: 734-547-1000 Fax: 734-480-9195	EPA ID # MIR 000 033 969 EPA ID # MI0 000 263 871
☐ **EQ Indianapolis** (Drum Transfer/Non-Hazardous Waste Processing)	4000 West 10th Street, Indianapolis, IN 46222 Phone: 317-247-7160 Fax: 317-247-7170	EPA ID # MI0 000 263 871
☐ **EQ Atlanta** (Drum Transfer/Non-Hazardous Waste Processing)	5600 Fulton Industrial Blvd SW, Atlanta, GA 30336 Phone: 404-494-3520 Fax: 404-494-3560	EPA ID # MI0 000 263 871
☐ **EQ Augusta, Inc.** (Wastewater Treatment)	3920 Goshen Industrial Blvd, Augusta, GA 30906 Phone: 706-771-9100 Fax: 706-771-9124	EPA ID # GAR 000 011 817

Waste Common Name: Soil Borings - CTO174

Section 1 – Generator & Customer Information

SIC/NAICS*

Generator EPA ID #

Generator NAVFAC MIDLANT

Facility Address CAX Site 7

City Williamsburg State VA Zip

County

Mailing Address 9742 Maryland Av

City CodeOPHREV4 State Norfol Zip VA 23511

Generator Contact Christopher Murray

Title Remedial Project Manager

Phone 757-445-6680 Fax

*For a list of NAICS codes, please refer to Section 9 of the EQ Resource Guide.

Internal Use Only: EQ Division

EQ Customer No. 5247

Invoicing Company Capitol Environmental Services, Inc.

Address 200 Biddle Ae, Suite 205

City Newark State DE Zip 19702

Country USA

Invoicing Contact Terri Fort/Tammy Crotty

Phone 540-777-6547 Fax 540-777-6549

Technical Contact same

Phone Fax

Mobile Pager

E-mail terri.fort@capitol-environmental.com

Section 2 – Shipping & Packaging Information

2.1) Shipping Volume & Frequency 1 drums

☒ One Time Only ☐ Year ☐ Quarter ☐ Month

2.2) DOT Shipping Name Nonhazardous, NonDOT Regulated Soil

2.3) Is this waste surcharge exempt? ☐ Yes ☒ No

If yes, please attach a surcharge exemption form, found in Section 2 of the EQ Resource Guide.

2.4) Packaging (**check all that apply**)

☐ Bulk Solid (Yd^3 < 2000 lbs/yd^3)
☐ Bulk Solid (Ton >2000 lbs/yd^3)
☐ Bulk Liquids (Gallon)
☐ Totes, Size
☐ Cubic Yard Boxes/Bags
☒ Drums
☐ Other (palletized, 5 gal. Pail, etc.)

Quoted bulk disposal charges for solid materials will be billed by the cubic yard, if the waste density is less than 2,000lbs./cubic yard. If waste density is greater than 2,000 lbs./cubic yard, then bulk disposal charges will be billed by the ton, regardless of the approved container.

Section 3 – Physical Characteristics

3.1) Color brown 3.2) Odor none

3.3) Does this waste contain any "Potentially Odorous Constituents" as defined in the EQ Resource Guide? (Section 3) ☐ Yes ☒ No

3.4) Physical State at 70°F: ☒ Solid ☐ Dust/Powder ☐ Liquid ☐ Sludge

3.5) What is the pH of this waste? ☐ ≤2 ☐ 2.1-4.9 ☒ 5-10 ☐ 10.1-12.4 ☐ ≥12.5

3.6) What is the flash point of this waste? ☐ <90°F ☐ 90-140°F ☐ 140-199°F ☒ >200°F

3.7) Does this waste contain? **(check all that apply)** ☒ **None** ☐ Free Liquids ☐ Oily Residue ☐ Metal Fines

☐ Biodegradable Sorbants ☐ Amines ☐ Ammonia ☐ Dioxins ☐ Furans ☐ Biohazard

☐ Shock Sensitive Waste ☐ Reactive Waste ☐ Radioactive Waste ☐ Explosives ☐ Pyrophoric Waste ☐ Isocyanates

☐ Asbestos – non-friable ☐ Asbestos – friable

Section 4 – Waste Composition and Generating Process

4.1) Describe the physical composition of the waste (i.e., soil, water, PPE, debris, key chemical compounds, etc.)

soil >98% to % PPE, rags <2% to %

to % to %

Total: 100%

4.2) Provide a *detailed* description of the process generating this waste (attach flow diagram if available).
Soil borings and PPE generated during a subsurface investigation for metals and volatiles

Section 5 – Hazardous or Non-Hazardous Waste?

Please refer to Section 5 of the EQ Resource Guide for a list of waste codes

As determined by 40 CFR, Part 261 and State Rules: **Please list applicable waste code(s):**

5.1) Is this an EPA RCRA listed hazardous waste (F, K, P or U)? ☐ Yes ☒ No

5.2) Is this an EPA RCRA characteristic hazardous waste (D001-D043)? ☐ Yes ☒ No

5.3) Do any State Waste Codes apply? ☐ Yes ☒ No

5.4) Is this waste intended for wastewater treatment? ☐ Yes* ☒ No

If you answered 'no' to 5.1, 5.2, and 5.3, please skip to Section 7. *If you answered 'yes' to 5.4, please attach the Waste Characterization Report Addendum found in Section 7 of the EQ Resource Guide.

Section 6 – Hazardous Wastes

6.1) Does this waste exceed Land Disposal Restriction levels? ☐ Yes ☒ No

6.1a) If this waste stream is greater than 50% soil, does it meet the alternative soil treatment standards of 40 CFR 268.49? ☐ Yes ☒ No

6.1b) Does this waste contain greater than 50% debris, by volume? (Debris is greater than 2.5 inches in size.) ☐ Yes ☒ No

6.2) Is the waste an oxidizer (D001)? ☐ Yes ☒ No

6.3) Does this waste contain reactive cyanide ≥ 250 ppm (D003)? ☐ Yes ☒ No

6.4) Does this waste contain reactive sulfide ≥ 500 ppm (D003)? ☐ Yes ☒ No

6.5) Please indicate which constituent concentrations are below or above the regulatory level. Please indicate the basis used in the determination. Either "Below" or "Above" **MUST** be checked for each constituent.

Based On: ☐ **Generator Knowledge** ☒ **Analysis*** ☐ **MSDS*** ***Please attach a copy.**

Code		Regulatory Level TCLP (mg/l)	Concentration (if above)	Code		Regulatory Level TCLP (mg/l)	Concentration (if above)
D004	Arsenic	5	☒ Below ☐ Above	D024	m-Cresol	200	☒ Below ☐ Above
D005	Barium	100	☒ Below ☐ Above	D025	p-Cresol	200	☒ Below ☐ Above
D006	Cadmium	1	☒ Below ☐ Above	D026	Cresols	200	☒ Below ☐ Above
D007	Chromium	5	☒ Below ☐ Above	D027	1,4-Dichlorobenzene	7.5	☒ Below ☐ Above
D008	Lead	5	☒ Below ☐ Above	D028	1,2-Dicholoroethane	0.5	☒ Below ☐ Above
D009	Mercury	0.2	☒ Below ☐ Above	D029	1,1-Dichloroethylene	0.7	☒ Below ☐ Above
D010	Selenium	1	☒ Below ☐ Above	D030	2,4-Dinitrotoluene	0.13	☒ Below ☐ Above
D011	Silver	5	☒ Below ☐ Above	D031	Heptachlor	0.008	☒ Below ☐ Above
D012	Endrin	0.02	☒ Below ☐ Above	D032	Hexachlorobenzene	0.13	☒ Below ☐ Above
D013	Lindane	0.4	☒ Below ☐ Above	D033	Hexachlorobutadiene	0.5	☒ Below ☐ Above
D014	Methoxychlor	10	☒ Below ☐ Above	D034	Hexachloroethane	3.0	☒ Below ☐ Above
D015	Toxaphene	0.5	☒ Below ☐ Above	D035	Methyl Ethyl Ketone	200	☒ Below ☐ Above
D016	2,4-D	10	☒ Below ☐ Above	D036	Nitrobenzene	2	☒ Below ☐ Above
D017	2,4,5-TP (Silvex)	1	☒ Below ☐ Above	D037	Pentachlorophenol	100	☒ Below ☐ Above
D018	Benzene	0.5	☒ Below ☐ Above	D038	Pyridine	5	☒ Below ☐ Above
D019	Carbon Tetrachloride	0.5	☒ Below ☐ Above	D039	Tetrachloroethylene	0.7	☒ Below ☐ Above
D020	Chlordane	0.03	☒ Below ☐ Above	D040	Trichloroethylene	0.5	☒ Below ☐ Above
D021	Chlorobenzene	100	☒ Below ☐ Above	D041	2,4,5-Trichlorophenol	400	☒ Below ☐ Above
D022	Chloroform	6.0	☒ Below ☐ Above	D042	2,4,6-Trichlorophenol	2	☒ Below ☐ Above
D023	o-Cresol	200	☒ Below ☐ Above	D043	Vinyl Chloride	0.2	☒ Below ☐ Above

6.6) If this is a characteristic hazardous waste, does it contain underlying hazardous constituents? ☐ Yes ☒ No
If yes, please list the constituents in Section 11.

Section 7 – Non-Hazardous Wastes

For a complete list of non-hazardous waste codes, please refer to Section 7 of the EQ Resource Guide

Please list applicable waste code:

7.1) Is this a Michigan non-hazardous liquid industrial waste? ☐ Yes ☒ No
7.2) Is this a Universal waste? ☐ Yes ☒ No
7.3) Is this a Recyclable Commodity? (e.g.: computer monitors, free mercury, etc.) ☐ Yes ☒ No
7.4) Is this waste a recoverable petroleum product? ☐ Yes* ☒ No
7.5) Is this waste used oil as defined by 40 CFR Part 279? ☐ Yes* ☒ No

If you answered 'yes' to questions 7.4 or 7.5 please attach the Waste Characterization Report Addendum found in Section 7 of the EQ Resource Guide.

Section 8 – TSCA Information

8.1) What is the concentration of PCBs in the waste? ☒ None ☐ 0-5 ppm ☐ 6-49 ppm ☐ 50-499 ppm ☐ 500+ ppm
8.2) Does the waste contain PCB contamination from a source with a concentration ≥ 50 ppm? ☐ Yes ☒ No
If you answered "no" to 8.1 and 8.2, please skip to Section 9.
8.3) Has this waste been processed into a non-liquid form? ☐ Yes ☐ No
If yes, what was the concentration of PCBs prior to processing? ☐ N/A ☐ 0-499 ppm ☐ 500+ ppm
8.4) Is the non-liquid PCB waste in the form of soil, rags, debris, or other contaminated media? ☐ Yes ☐ No
8.5) Are you a PCB capacitor manufacturer or a PCB equipment manufacturer? ☐ Yes ☐ No
8.6) Has the PCB Article (e.g., transformer, hydraulic machine, PCB-contaminated electrical equipment) been drained/flushed of all PCBs and decontaminated in accordance with 40 CFR 761.60(b)? ☐ N/A ☐ Yes ☐ No

Section 9 – Clean Air Act Information

NESHAP SIC*		
2812	2836	2875
2813	2841	2879
2816	2842	2891
2819	2843	2892
2821	2844	2893
2822	2851	2895
2823	2861	2899
2824	2865	2911
2833	2869	3312
2834	2873	4953
2835	2874	9511

9.1) Is this waste subject to regulation under 40 CFR, Part 63, Subpart DD or 40 CFR, Part 264, Subpart CC (RCRA)? ☐ Yes ☒ No
(Does the waste contain >500 ppm Volatile Organic Hazardous Air Pollutants – VOHAP's or Volalite Organic Compounds – VOC's?)
For a complete list of VOHAP's, please see Section 11 of the EQ Resource Guide
9.2) Does this waste stream contain Benzene? ☐ Yes ☒ No
If you answered "no" to 9.2, please skip to Section 10.
9.3) Does the waste stream come from a facility with one of the SIC codes listed under the NESHAP? ☐ Yes ☐ No
9.4) Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) ≥10 Mg/year? ☐ Yes ☐ No
For assistance in calculating the TAB, please see the TAB Worksheet in Section 9 of the EQ Resource Guide.
If you answered "no" to question 9.3 and 9.4, please skip to Section 10.
9.5) Does the waste contain >10% water? ☐ Yes ☐ No
9.6) What is the TAB quantity for your facility? Mg/Year
9.7) Does the waste contain >1.0 mg/kg total Benzene? ☐ Yes ☐ No
9.8) What is the total Benzene concentration in your waste? Percent or ppmw.
(Do not use TCLP analytical results. Acceptable laboratory methods include 8020, 8240, 8260, 602 and 624.)
*For a list of NAICS codes, please refer to Section 9 of the EQ Resource Guide.

Section 10 – Fuel Blending Information

10.1) Is this waste intended for fuel blending? ☐ Yes* ☒ No
*If yes, Heat value (BTU/lb.) Chlorine (%) Water (%) Solids (%)
10.2) Is this waste intended for reclamation? ☐ Yes ☒ No (5-Gallon Sample required for all reclaim waste streams)

Section 11 – Constituent Information

Please identify your waste constituents from these four categories: ***Underlying Hazardous Constituents (UHC's), Volatile Organic Hazardous Air Pollutants (VOHAP's), Volatile Organic Compounds (VOC's) and Toxic Release Inventory Constituents (TRI)***

Constituent		Concentration	UHC?	Constituent		Concentration	UHC?
N/A	☐ Yes	☐ No			☐ Yes	☐ No	
	☐ Yes	☐ No			☐ Yes	☐ No	
	☐ Yes	☐ No			☐ Yes	☐ No	
	☐ Yes	☐ No			☐ Yes	☐ No	
	☐ Yes	☐ No			☐ Yes	☐ No	

Please see Section 11 of the EQ Resource Guide for a list of UHC's, VOHAP's and VOC's. For a complete list of TRI constituents, please refer to 40 CFR 372.65.

Section 12 – Certification

I certify that all information (including attachments) is complete and factual and is an accurate representation of the known and suspected hazards, pertaining to the waste described herein. I authorize EQ's Resource Team to add supplemental information to the waste approval file, provided I am contacted and give verbal permission. I authorize EQ's Resource Team to obtain a sample from any waste shipment for purposes of verification and confirmation. I agree that, if EQ approves the waste described herein, all such wastes that are transported, delivered, or tendered to EQ by Generator or on Generator's behalf shall be subject to, and Generator shall be bound by, the attached Standard Terms and Conditions.

Generator Signature C. R. Murray Printed Name Christopher Murray

Company NAVFAC Mid Atlantic
Title Date

The generator's signature MUST appear on the EQ Waste Characterization Report. If the generator has authorized a third party to certify this document, a written notice (on generator letterhead) must accompany this submittal. Although the EQ Resource Team is authorized to make certain modifications to the information provided on this form, the addition or removal of waste codes and waste constituents must be documented by the generator.

STANDARD TERMS AND CONDITIONS

The Agreement between the Customer and EQ – The Environmental Quality Company and/or its member companies (hereinafter "EQ") related to or associated with Delivered Waste, as herein defined, shall be governed by the following Standard Terms and Conditions in addition to the terms and conditions contained in any Waste Characterization Report, Customer Approval Quote Confirmation, Generator Approval Notification, Notice of Waste Approval Expiration, and/or Credit Agreement associated with such Delivered Waste.

The Customer may use its standard forms (such as purchase orders, acknowledgments of orders, and invoices) to administer its dealings under this Agreement for convenience purposes, but all provisions thereof in conflict with these terms and conditions shall be deemed stricken.

Definitions

The following definitions shall apply for purposes of this Agreement:

"Acceptable Waste" shall mean any hazardous waste, as defined under applicable State or federal law, determined by EQ as acceptable for treatment and/or disposal in accordance with this Agreement.

"Delivered Wastes" shall mean all wastes (i) which are transported, delivered, or tendered to EQ by the Customer; (ii) which the Customer has arranged for the transport, delivery or tender to EQ; or (iii)) which are transported, delivered, or tendered to EQ under a Credit Agreement between the Customer and EQ.

"Non-Conforming Wastes" shall mean wastes that (a) are not in accordance in all material respects with the warranties, descriptions, specifications or limitations stated in the Waste Characterization Report and this Agreement; (b) have constituents or components of a type or concentration not specifically identified in the Waste Characterization Report (i) which increase the nature or extent of the hazard and risk undertaken by EQ in treating and/or disposing of the waste, or (ii) for whose treatment and/or disposal a Waste Management Facility is not designed or permitted, or (iii) which increase the cost of treatment and/or disposal of waste beyond that specified in EQ's price quote; or (c) are not properly packaged, labeled, described, or placarded, or otherwise not in compliance with United States Department of Transportation and United States Environmental Protection Agency regulations.

Control of Operations.

EQ shall have sole control over all aspects of the operation of any treatment and/or disposal facility of EQ receiving Delivered Wastes under this Agreement (hereinafter, "Waste Management Facility"), including, without limitation, maintaining EQ's desired volume of Acceptable Wastes being delivered to any Waste Management Facility by the Customer or any other person or entity.

Identification of Waste.

For each waste material to be transported, delivered, or tendered to EQ under this Agreement, the Customer shall provide, or cause to be provided, to EQ a representative sample of the waste material and a completed Waste Characterization Report containing a physical and chemical description or analysis of such waste material, which description shall conform with any and all guidelines for waste acceptance provided by EQ. On the basis of EQ's analysis of such representative sample of the waste material and such Waste Characterization Report, EQ will determine whether such wastes are Acceptable Wastes. EQ does not make any guarantee that it will handle any waste material or any particular quantity or type of waste material, and EQ reserves the right to the decline to transport, treat and/or dispose of waste material. The Customer shall promptly furnish to EQ any information regarding known, suspected or planned changes in the composition of the waste material. Further, the Customer shall promptly inform EQ of any change in the characteristic or condition of the waste material which becomes known to the Customer subsequent to the date of the Waste Characterization Report.

Non-Conforming Wastes.

In the event that EQ at any time discovers that any Delivered Waste is Non-Conforming Waste, EQ may reject or revoke its acceptance of the Non-Conforming Waste. The Customer shall have seven (7) days to direct an alternative lawful manner of disposition of the waste, unless it is necessary by reason of law or otherwise to move the Non-Conforming Waste prior to expiration of the seven (7) day period. If the Customer does not direct an alternative disposal, at its option, EQ may return any such Non-Conforming Wastes to the Customer, and the Customer shall pay or reimburse EQ for all costs and expenses incurred by EQ in connection with the receipt, handling, sampling, analyses, transportation and return to the Customer of such Non-Conforming Wastes. If it is impossible or impractical for EQ to return the Non-Conforming Waste to the Customer, the Customer shall reimburse EQ for all costs, of any type or nature whatsoever, incurred by EQ, solely because such Delivered Waste was Non-Conforming Waste (including, but not limited to, all costs associated with any remedial steps necessary, due to the nature of the Non-Conforming Waste, in connection with material with which the Non-Conforming Waste may have been commingled and all expenses and charges for analyzing, handling, locating, preparing for transporting, storing and disposing of any Non-Conforming Waste).

Customer Warranty - Acceptable Wastes.

All Delivered Wastes shall be Acceptable Wastes and shall conform in all material respects to the description and specifications contained in the Waste Characterization Report. The information set forth in the Waste Characterization Report or any manifest, placard or label associated with any Delivered Wastes, or otherwise represented by the Customer or the generator (if other than the Customer) to EQ, is and shall be true, accurate and complete as of the date of receipt of the involved waste by EQ.

Customer Warranty - Title to Wastes.

Either the Customer or the generator (if other than the Customer) shall hold clear title, free of any all liens, claims, encumbrances, and charges to Delivered Waste until such waste is accepted by EQ.

Customer Warranty - Compliance with Laws.

The Customer shall comply with all applicable federal, state and local environmental statutes, regulations, and other governmental requirements, as well as directives issued by EQ from time to time, governing the transportation, treatment and/or disposal of Acceptable Wastes, including, but not limited to, all packaging, manifesting, containerization, placarding and labeling requirements.

Customer Warranty - Updating Information.

If the Customer receives information that Delivered Waste or other hazardous waste described in the Waste Characterization Report, or some component of such waste, presents or may present a hazard or risk to persons, property or the environment which was not disclosed to EQ, or if the Customer or generator (if other than the Customer) has changed the process by which such waste results, the Customer shall promptly report such information to EQ in writing.

Customer Indemnity.

The Customer shall indemnify, defend and hold harmless EQ, and its affiliated or related companies, and all of their respective present or future officers, directors, shareholders, employees and agents from and against any and all losses, damages, liabilities, penalties, fines, forfeitures, demands, claims, causes of action, suits, costs and expenses (including, but not limited to, reasonable costs of defense, settlement, and reasonable attorneys' fees), which may be asserted against any or all of them by any person or any governmental agency, or which any or all of them may hereafter suffer, incur, be responsible for or pay out, as a result of or in connection with bodily injuries (including, but not limited to, death, sickness, disease and emotional or mental distress) to any person (including EQ's employees), damage (including, but not limited to, loss of use) to any property (public or private), or any requirements to conduct or incur expense for investigative, removal or remedial expenses in connection with contamination of or adverse effect on the environment, or any violation or alleged violation of any statues, ordinances, orders, rules or regulations of any governmental entity or agency, caused or arising out of (i) a breach of this Agreement by the Customer, (ii) the failure of any warranty of the Customer to be true, accurate and complete, or (iii) any willful or negligent act or omission of the Customer, or its employees or agents in connection with the performance of this Agreement.

Force Majeure

EQ shall not be liable for any failure to accept, receive, handle, treat, and/or dispose of Delivered Waste due to an act of God, fire, casualty, flood, war, strike, lockout, labor trouble, failure of public utilities, equipment failure, facility shutdown, injunction, accident, epidemic, riot, insurrection, destruction of operation or transportation facilities, the inability to procure materials, equipment, or sufficient personnel or energy in order to meet operational needs without the necessity of allocation, the failure or inability to obtain any governmental approvals or to meet Environmental Requirements (including, but not limited to voluntary or involuntary compliance with any act, exercise, assertion, or requirement of any governmental authority) which may temporarily or permanently prohibit operations of EQ, the Customer, or the Generator, or any other circumstances beyond the control of EQ which prevents or delays performance of any of its obligations under this Agreement.

Governing Laws

This Agreement shall in all respects be governed by and shall be construed in accordance with the laws of the State of Michigan applied to contracts executed and performed wholly within such state.

Tracking #

WASTE CHARACTERIZATION REPORT

☒ ***I authorize EQ – The Environmental Quality Company to choose the appropriate method of waste management, from the technologies offered, at the EQ facilities identified below.***

☐ **Michigan Disposal Waste Treatment Plant** (Stabilization and Treatment)	49350 N. I-94 Service Drive, Belleville, MI 48111 Phone: 800-592-5489	Fax: 800-592-5329	EPA ID # MID 000 724 831
☐ **Wayne Disposal, Inc. Site #2 Landfill** (Hazardous & Chemical Waste Landfill)	49350 N. I-94 Service Drive, Belleville, MI 48111 Phone: 800-592-5489	Fax: 800-592-5329	EPA ID # MID 048 090 633
☐ **EQ Detroit, Inc.** (Stabilization, Wastewater Treatment)	1923 Frederick Street, Detroit, MI 48211 Phone: (313) 923-0080	Fax: 313-923-3375	EPA ID # MID 980 991 566
☐ **EQ Resource Recovery, Inc.** (Solvent Recycling, Fuel Blending, WW Treatment)	36345 Van Born Road, Romulus, MI 48174 Phone: 866-373-8357	Fax: 734-326-4033	EPA ID # MID 060 975 844
☐ **EQ North Carolina** (Stabilization, Treatment, Labpack Decommissioning)	1005 Investment Blvd, Apex, NC 27502 Phone: 919-363-4700	Fax: 919-363-4714	EPA ID # NCD 982 170 292
☒ **EQ Florida, Inc.** (Drum Consolidation, Labpack Decommissioning)	7202 East 8th Ave, Tampa, FL 33619 Phone: 813-623-5463	Fax: 813-628-0842	EPA ID # FLD 981 932 494
☐ **EQ Transfer & Processing** (Drum Transfer/Non-Hazardous Waste Processing)	1010 Old Rawsonville Rd., Ypsilanti, MI 48198 Phone: 734-547-1000	Fax: 734-480-9195	EPA ID # MIR 000 033 969 EPA ID # MI0 000 263 871
☐ **EQ Indianapolis** (Drum Transfer/Non-Hazardous Waste Processing)	4000 West 10th Street, Indianapolis, IN 46222 Phone: 317-247-7160	Fax: 317-247-7170	EPA ID # MI0 000 263 871
☐ **EQ Atlanta** (Drum Transfer/Non-Hazardous Waste Processing)	5600 Fulton Industrial Blvd SW, Atlanta, GA 30336 Phone: 404-494-3520	Fax: 404-494-3560	EPA ID # MI0 000 263 871
☐ **EQ Augusta, Inc.** (Wastewater Treatment)	3920 Goshen Industrial Blvd, Augusta, GA 30906 Phone: 706-771-9100	Fax: 706-771-9124	EPA ID # GAR 000 011 817

Waste Common Name: Soil and hydraulic oil

Section 1 – Generator & Customer Information

SIC/NAICS*

Generator EPA ID #

Generator NAVFAC MIDLANT

Facility Address CAX Site 7

City Williamsburg State VA Zip

County

Mailing Address 9742 Maryland Av

City CodeOPHREV4 State Norfol Zip VA 23511

Generator Contact Christopher Murray

Title Remedial Project Manager

Phone 757-445-6680 Fax

*For a list of NAICS codes, please refer to Section 9 of the EQ Resource Guide.

Internal Use Only: EQ Division

EQ Customer No. 5247

Invoicing Company Capitol Environmental Services, Inc.

Address 200 Biddle Ae, Suite 205

City Newark State DE Zip 19702

Country USA

Invoicing Contact Terri Fort/Tammy Crotty

Phone 540-777-6547 Fax 540-777-6549

Technical Contact same

Phone Fax

Mobile Pager

E-mail terri.fort@capitol-environmental.com

Section 2 – Shipping & Packaging Information

2.1) Shipping Volume & Frequency 1 drums

☒ One Time Only ☐ Year ☐ Quarter ☐ Month

2.2) DOT Shipping Name Nonhazardous, NonDOT Regulated Petroleum contaminated Soil

2.3) Is this waste surcharge exempt? ☐ Yes ☒ No

If yes, please attach a surcharge exemption form, found in Section 2 of the EQ Resource Guide.

2.4) Packaging (**check all that apply**)

☐ Bulk Solid (Yd^3 < 2000 lbs/yd^3)
☐ Bulk Solid (Ton >2000 lbs/yd^3)
☐ Bulk Liquids (Gallon)
☐ Totes, Size
☐ Cubic Yard Boxes/Bags
☒ Drums
☐ Other (palletized, 5 gal. Pail, etc.)

Quoted bulk disposal charges for solid materials will be billed by the cubic yard, if the waste density is less than 2,000lbs./cubic yard. If waste density is greater than 2,000 lbs./cubic yard, then bulk disposal charges will be billed by the ton, regardless of the approved container.

Section 3 – Physical Characteristics

3.1) Color brown 3.2) Odor none

3.3) Does this waste contain any "Potentially Odorous Constituents" as defined in the EQ Resource Guide? (Section 3) ☐ Yes ☒ No

3.4) Physical State at 70°F: ☒ Solid ☐ Dust/Powder ☒ Liquid ☐ Sludge

3.5) What is the pH of this waste? ☐ ≤2 ☐ 2.1-4.9 ☒ 5-10 ☐ 10.1-12.4 ☐ ≥12.5

3.6) What is the flash point of this waste? ☐ <90°F ☐ 90-140°F ☐ 140-199°F ☒ >200°F

3.7) Does this waste contain? **(check all that apply)** ☒ **None** ☐ Free Liquids ☐ Oily Residue ☐ Metal Fines

☐ Biodegradable Sorbants ☐ Amines ☐ Ammonia ☐ Dioxins ☐ Furans ☐ Biohazard

☐ Shock Sensitive Waste ☐ Reactive Waste ☐ Radioactive Waste ☐ Explosives ☐ Pyrophoric Waste ☐ Isocyanates

☐ Asbestos – non-friable ☐ Asbestos – friable

Section 4 – Waste Composition and Generating Process

4.1) Describe the physical composition of the waste (i.e., soil, water, PPE, debris, key chemical compounds, etc.)

soil 75% to % PPE, rags <2% to %

hydraulic oil 25% to % to %

Total: 100%

4.2) Provide a *detailed* description of the process generating this waste (attach flow diagram if available).
Hydraulic oil leaked out of a piece of equipment onto clean soil

Section 5 – Hazardous or Non-Hazardous Waste?

Please refer to Section 5 of the EQ Resource Guide for a list of waste codes

As determined by 40 CFR, Part 261 and State Rules: **Please list applicable waste code(s):**

5.1) Is this an EPA RCRA listed hazardous waste (F, K, P or U)? ☐ Yes ☒ No

5.2) Is this an EPA RCRA characteristic hazardous waste (D001-D043)? ☐ Yes ☒ No

5.3) Do any State Waste Codes apply? ☐ Yes ☒ No

5.4) Is this waste intended for wastewater treatment? ☐ Yes* ☒ No

If you answered 'no' to 5.1, 5.2, and 5.3, please skip to Section 7. *If you answered 'yes' to 5.4, please attach the Waste Characterization Report Addendum found in Section 7 of the EQ Resource Guide.

Section 6 – Hazardous Wastes

6.1) Does this waste exceed Land Disposal Restriction levels? ☐ Yes ☒ No

6.1a) If this waste stream is greater than 50% soil, does it meet the alternative soil treatment standards of 40 CFR 268.49? ☐ Yes ☒ No

6.1b) Does this waste contain greater than 50% debris, by volume? (Debris is greater than 2.5 inches in size.) ☐ Yes ☒ No

6.2) Is the waste an oxidizer (D001)? ☐ Yes ☒ No

6.3) Does this waste contain reactive cyanide ≥ 250 ppm (D003)? ☐ Yes ☒ No

6.4) Does this waste contain reactive sulfide ≥ 500 ppm (D003)? ☐ Yes ☒ No

6.5) Please indicate which constituent concentrations are below or above the regulatory level. Please indicate the basis used in the determination. Either "Below" or "Above" **MUST** be checked for each constituent.

Based On: ☐ **Generator Knowledge** ☒ **Analysis*** ☐ **MSDS*** ***Please attach a copy.**

Code		Regulatory Level TCLP (mg/l)	Concentration (if above)	Code		Regulatory Level TCLP (mg/l)	Concentration (if above)
D004	Arsenic	5	☒ Below ☐ Above	D024	m-Cresol	200	☒ Below ☐ Above
D005	Barium	100	☒ Below ☐ Above	D025	p-Cresol	200	☒ Below ☐ Above
D006	Cadmium	1	☒ Below ☐ Above	D026	Cresols	200	☒ Below ☐ Above
D007	Chromium	5	☒ Below ☐ Above	D027	1,4-Dichlorobenzene	7.5	☒ Below ☐ Above
D008	Lead	5	☒ Below ☐ Above	D028	1,2-Dicholoroethane	0.5	☒ Below ☐ Above
D009	Mercury	0.2	☒ Below ☐ Above	D029	1,1-Dichloroethylene	0.7	☒ Below ☐ Above
D010	Selenium	1	☒ Below ☐ Above	D030	2,4-Dinitrotoluene	0.13	☒ Below ☐ Above
D011	Silver	5	☒ Below ☐ Above	D031	Heptachlor	0.008	☒ Below ☐ Above
D012	Endrin	0.02	☒ Below ☐ Above	D032	Hexachlorobenzene	0.13	☒ Below ☐ Above
D013	Lindane	0.4	☒ Below ☐ Above	D033	Hexachlorobutadiene	0.5	☒ Below ☐ Above
D014	Methoxychlor	10	☒ Below ☐ Above	D034	Hexachloroethane	3.0	☒ Below ☐ Above
D015	Toxaphene	0.5	☒ Below ☐ Above	D035	Methyl Ethyl Ketone	200	☒ Below ☐ Above
D016	2,4-D	10	☒ Below ☐ Above	D036	Nitrobenzene	2	☒ Below ☐ Above
D017	2,4,5-TP (Silvex)	1	☒ Below ☐ Above	D037	Pentachlorophenol	100	☒ Below ☐ Above
D018	Benzene	0.5	☒ Below ☐ Above	D038	Pyridine	5	☒ Below ☐ Above
D019	Carbon Tetrachloride	0.5	☒ Below ☐ Above	D039	Tetrachloroethylene	0.7	☒ Below ☐ Above
D020	Chlordane	0.03	☒ Below ☐ Above	D040	Trichloroethylene	0.5	☒ Below ☐ Above
D021	Chlorobenzene	100	☒ Below ☐ Above	D041	2,4,5-Trichlorophenol	400	☒ Below ☐ Above
D022	Chloroform	6.0	☒ Below ☐ Above	D042	2,4,6-Trichlorophenol	2	☒ Below ☐ Above
D023	o-Cresol	200	☒ Below ☐ Above	D043	Vinyl Chloride	0.2	☒ Below ☐ Above

6.6) If this is a characteristic hazardous waste, does it contain underlying hazardous constituents? ☐ Yes ☒ No
If yes, please list the constituents in Section 11.

Section 7 – Non-Hazardous Wastes

For a complete list of non-hazardous waste codes, please refer to Section 7 of the EQ Resource Guide

Please list applicable waste code:

7.1) Is this a Michigan non-hazardous liquid industrial waste? ☐ Yes ☒ No
7.2) Is this a Universal waste? ☐ Yes ☒ No
7.3) Is this a Recyclable Commodity? (e.g.: computer monitors, free mercury, etc.) ☐ Yes ☒ No
7.4) Is this waste a recoverable petroleum product? ☐ Yes* ☒ No
7.5) Is this waste used oil as defined by 40 CFR Part 279? ☐ Yes* ☒ No

If you answered 'yes' to questions 7.4 or 7.5 please attach the Waste Characterization Report Addendum found in Section 7 of the EQ Resource Guide.

Section 8 – TSCA Information

8.1) What is the concentration of PCBs in the waste? ☒ None ☐ 0-5 ppm ☐ 6-49 ppm ☐ 50-499 ppm ☐ 500+ ppm
8.2) Does the waste contain PCB contamination from a source with a concentration ≥ 50 ppm? ☐ Yes ☒ No
If you answered "no" to 8.1 and 8.2, please skip to Section 9.
8.3) Has this waste been processed into a non-liquid form? ☐ Yes ☐ No
If yes, what was the concentration of PCBs prior to processing? ☐ N/A ☐ 0-499 ppm ☐ 500+ ppm
8.4) Is the non-liquid PCB waste in the form of soil, rags, debris, or other contaminated media? ☐ Yes ☐ No
8.5) Are you a PCB capacitor manufacturer or a PCB equipment manufacturer? ☐ Yes ☐ No
8.6) Has the PCB Article (e.g., transformer, hydraulic machine, PCB-contaminated electrical equipment) been drained/flushed of all PCBs and decontaminated in accordance with 40 CFR 761.60(b)? ☐ N/A ☐ Yes ☐ No

Section 9 – Clean Air Act Information

NESHAP SIC*		
2812	2836	2875
2813	2841	2879
2816	2842	2891
2819	2843	2892
2821	2844	2893
2822	2851	2895
2823	2861	2899
2824	2865	2911
2833	2869	3312
2834	2873	4953
2835	2874	9511

9.1) Is this waste subject to regulation under 40 CFR, Part 63, Subpart DD or 40 CFR, Part 264, Subpart CC (RCRA)? ☐ Yes ☒ No
(Does the waste contain >500 ppm Volatile Organic Hazardous Air Pollutants – VOHAP's or Volalite Organic Compounds – VOC's?)
For a complete list of VOHAP's, please see Section 11 of the EQ Resource Guide
9.2) Does this waste stream contain Benzene? ☐ Yes ☒ No
If you answered "no" to 9.2, please skip to Section 10.
9.3) Does the waste stream come from a facility with one of the SIC codes listed under the NESHAP? ☐ Yes ☐ No
9.4) Is the generating source of this waste stream a facility with Total Annual Benzene (TAB) ≥10 Mg/year? ☐ Yes ☐ No
For assistance in calculating the TAB, please see the TAB Worksheet in Section 9 of the EQ Resource Guide.
If you answered "no" to question 9.3 and 9.4, please skip to Section 10.
9.5) Does the waste contain >10% water? ☐ Yes ☐ No
9.6) What is the TAB quantity for your facility? Mg/Year
9.7) Does the waste contain >1.0 mg/kg total Benzene? ☐ Yes ☐ No
9.8) What is the total Benzene concentration in your waste? Percent or ppmw.
(Do not use TCLP analytical results. Acceptable laboratory methods include 8020, 8240, 8260, 602 and 624.)
*For a list of NAICS codes, please refer to Section 9 of the EQ Resource Guide.

Section 10 – Fuel Blending Information

10.1) Is this waste intended for fuel blending? ☐ Yes* ☒ No
*If yes, Heat value (BTU/lb.) Chlorine (%) Water (%) Solids (%)
10.2) Is this waste intended for reclamation? ☐ Yes ☒ No (5-Gallon Sample required for all reclaim waste streams)

Section 11 – Constituent Information

Please identify your waste constituents from these four categories: ***Underlying Hazardous Constituents (UHC's), Volatile Organic Hazardous Air Pollutants (VOHAP's), Volatile Organic Compounds (VOC's) and Toxic Release Inventory Constituents (TRI)***

Constituent	Concentration	UHC?	Constituent	Concentration	UHC?
N/A		☐ Yes ☐ No			☐ Yes ☐ No
		☐ Yes ☐ No			☐ Yes ☐ No
		☐ Yes ☐ No			☐ Yes ☐ No
		☐ Yes ☐ No			☐ Yes ☐ No
		☐ Yes ☐ No			☐ Yes ☐ No

Please see Section 11 of the EQ Resource Guide for a list of UHC's, VOHAP's and VOC's. For a complete list of TRI constituents, please refer to 40 CFR 372.65.

Section 12 – Certification

I certify that all information (including attachments) is complete and factual and is an accurate representation of the known and suspected hazards, pertaining to the waste described herein. I authorize EQ's Resource Team to add supplemental information to the waste approval file, provided I am contacted and give verbal permission. I authorize EQ's Resource Team to obtain a sample from any waste shipment for purposes of verification and confirmation. I agree that, if EQ approves the waste described herein, all such wastes that are transported, delivered, or tendered to EQ by Generator or on Generator's behalf shall be subject to, and Generator shall be bound by, the attached Standard Terms and Conditions.

Generator Signature C. R. Murray Printed Name Christopher Murray

Company NAVFAC Mid Atlantic
Title Date

The generator's signature MUST appear on the EQ Waste Characterization Report. If the generator has authorized a third party to certify this document, a written notice (on generator letterhead) must accompany this submittal. Although the EQ Resource Team is authorized to make certain modifications to the information provided on this form, the addition or removal of waste codes and waste constituents must be documented by the generator.

STANDARD TERMS AND CONDITIONS

The Agreement between the Customer and EQ – The Environmental Quality Company and/or its member companies (hereinafter "EQ") related to or associated with Delivered Waste, as herein defined, shall be governed by the following Standard Terms and Conditions in addition to the terms and conditions contained in any Waste Characterization Report, Customer Approval Quote Confirmation, Generator Approval Notification, Notice of Waste Approval Expiration, and/or Credit Agreement associated with such Delivered Waste.

The Customer may use its standard forms (such as purchase orders, acknowledgments of orders, and invoices) to administer its dealings under this Agreement for convenience purposes, but all provisions thereof in conflict with these terms and conditions shall be deemed stricken.

Definitions

The following definitions shall apply for purposes of this Agreement:

"Acceptable Waste" shall mean any hazardous waste, as defined under applicable State or federal law, determined by EQ as acceptable for treatment and/or disposal in accordance with this Agreement.

"Delivered Wastes" shall mean all wastes (i) which are transported, delivered, or tendered to EQ by the Customer; (ii) which the Customer has arranged for the transport, delivery or tender to EQ; or (iii)) which are transported, delivered, or tendered to EQ under a Credit Agreement between the Customer and EQ.

"Non-Conforming Wastes" shall mean wastes that (a) are not in accordance in all material respects with the warranties, descriptions, specifications or limitations stated in the Waste Characterization Report and this Agreement; (b) have constituents or components of a type or concentration not specifically identified in the Waste Characterization Report (i) which increase the nature or extent of the hazard and risk undertaken by EQ in treating and/or disposing of the waste, or (ii) for whose treatment and/or disposal a Waste Management Facility is not designed or permitted, or (iii) which increase the cost of treatment and/or disposal of waste beyond that specified in EQ's price quote; or (c) are not properly packaged, labeled, described, or placarded, or otherwise not in compliance with United States Department of Transportation and United States Environmental Protection Agency regulations.

Control of Operations.

EQ shall have sole control over all aspects of the operation of any treatment and/or disposal facility of EQ receiving Delivered Wastes under this Agreement (hereinafter, "Waste Management Facility"), including, without limitation, maintaining EQ's desired volume of Acceptable Wastes being delivered to any Waste Management Facility by the Customer or any other person or entity.

Identification of Waste.

For each waste material to be transported, delivered, or tendered to EQ under this Agreement, the Customer shall provide, or cause to be provided, to EQ a representative sample of the waste material and a completed Waste Characterization Report containing a physical and chemical description or analysis of such waste material, which description shall conform with any and all guidelines for waste acceptance provided by EQ. On the basis of EQ's analysis of such representative sample of the waste material and such Waste Characterization Report, EQ will determine whether such wastes are Acceptable Wastes. EQ does not make any guarantee that it will handle any waste material or any particular quantity or type of waste material, and EQ reserves the right to the decline to transport, treat and/or dispose of waste material. The Customer shall promptly furnish to EQ any information regarding known, suspected or planned changes in the composition of the waste material. Further, the Customer shall promptly inform EQ of any change in the characteristic or condition of the waste material which becomes known to the Customer subsequent to the date of the Waste Characterization Report.

Non-Conforming Wastes.

In the event that EQ at any time discovers that any Delivered Waste is Non-Conforming Waste, EQ may reject or revoke its acceptance of the Non-Conforming Waste. The Customer shall have seven (7) days to direct an alternative lawful manner of disposition of the waste, unless it is necessary by reason of law or otherwise to move the Non-Conforming Waste prior to expiration of the seven (7) day period. If the Customer does not direct an alternative disposal, at its option, EQ may return any such Non-Conforming Wastes to the Customer, and the Customer shall pay or reimburse EQ for all costs and expenses incurred by EQ in connection with the receipt, handling, sampling, analyses, transportation and return to the Customer of such Non-Conforming Wastes. If it is impossible or impractical for EQ to return the Non-Conforming Waste to the Customer, the Customer shall reimburse EQ for all costs, of any type or nature whatsoever, incurred by EQ, solely because such Delivered Waste was Non-Conforming Waste (including, but not limited to, all costs associated with any remedial steps necessary, due to the nature of the Non-Conforming Waste, in connection with material with which the Non-Conforming Waste may have been commingled and all expenses and charges for analyzing, handling, locating, preparing for transporting, storing and disposing of any Non-Conforming Waste).

Customer Warranty - Acceptable Wastes.

All Delivered Wastes shall be Acceptable Wastes and shall conform in all material respects to the description and specifications contained in the Waste Characterization Report. The information set forth in the Waste Characterization Report or any manifest, placard or label associated with any Delivered Wastes, or otherwise represented by the Customer or the generator (if other than the Customer) to EQ, is and shall be true, accurate and complete as of the date of receipt of the involved waste by EQ.

Customer Warranty - Title to Wastes.

Either the Customer or the generator (if other than the Customer) shall hold clear title, free of any all liens, claims, encumbrances, and charges to Delivered Waste until such waste is accepted by EQ.

Customer Warranty - Compliance with Laws.

The Customer shall comply with all applicable federal, state and local environmental statutes, regulations, and other governmental requirements, as well as directives issued by EQ from time to time, governing the transportation, treatment and/or disposal of Acceptable Wastes, including, but not limited to, all packaging, manifesting, containerization, placarding and labeling requirements.

Customer Warranty - Updating Information.

If the Customer receives information that Delivered Waste or other hazardous waste described in the Waste Characterization Report, or some component of such waste, presents or may present a hazard or risk to persons, property or the environment which was not disclosed to EQ, or if the Customer or generator (if other than the Customer) has changed the process by which such waste results, the Customer shall promptly report such information to EQ in writing.

Customer Indemnity.

The Customer shall indemnify, defend and hold harmless EQ, and its affiliated or related companies, and all of their respective present or future officers, directors, shareholders, employees and agents from and against any and all losses, damages, liabilities, penalties, fines, forfeitures, demands, claims, causes of action, suits, costs and expenses (including, but not limited to, reasonable costs of defense, settlement, and reasonable attorneys' fees), which may be asserted against any or all of them by any person or any governmental agency, or which any or all of them may hereafter suffer, incur, be responsible for or pay out, as a result of or in connection with bodily injuries (including, but not limited to, death, sickness, disease and emotional or mental distress) to any person (including EQ's employees), damage (including, but not limited to, loss of use) to any property (public or private), or any requirements to conduct or incur expense for investigative, removal or remedial expenses in connection with contamination of or adverse effect on the environment, or any violation or alleged violation of any statues, ordinances, orders, rules or regulations of any governmental entity or agency, caused or arising out of (i) a breach of this Agreement by the Customer, (ii) the failure of any warranty of the Customer to be true, accurate and complete, or (iii) any willful or negligent act or omission of the Customer, or its employees or agents in connection with the performance of this Agreement.

Force Majeure

EQ shall not be liable for any failure to accept, receive, handle, treat, and/or dispose of Delivered Waste due to an act of God, fire, casualty, flood, war, strike, lockout, labor trouble, failure of public utilities, equipment failure, facility shutdown, injunction, accident, epidemic, riot, insurrection, destruction of operation or transportation facilities, the inability to procure materials, equipment, or sufficient personnel or energy in order to meet operational needs without the necessity of allocation, the failure or inability to obtain any governmental approvals or to meet Environmental Requirements (including, but not limited to voluntary or involuntary compliance with any act, exercise, assertion, or requirement of any governmental authority) which may temporarily or permanently prohibit operations of EQ, the Customer, or the Generator, or any other circumstances beyond the control of EQ which prevents or delays performance of any of its obligations under this Agreement.

Governing Laws

This Agreement shall in all respects be governed by and shall be construed in accordance with the laws of the State of Michigan applied to contracts executed and performed wholly within such state.

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NON-HAZARDOUS WASTE MANIFEST

1. Generator ID Number: N/A
2. Page 1 of 1
3. Emergency Response Phone:
4. Waste Tracking Number:

5. Generator's Name and Mailing Address
NAVFAC MIDLANT
9742 Maryland Ave., City Code OPHREV4 Norfolk, VA 23511
Generator's Phone: 757 445-6680 Attn: Christopher Murray

Generator's Site Address (if different than mailing address)
NAVFAC MIDLANT
CAX Site 7
Williamsburg, VA 23273

6. Transporter 1 Company Name: LCM Corp
U.S. EPA ID Number: N/A

7. Transporter 2 Company Name:
U.S. EPA ID Number:

8. Designated Facility Name and Site Address
EQ Florida, Inc.
2002 Orient Road
Tampa, FL 33619
Facility's Phone: 813-623-5463
U.S. EPA ID Number: FLD 981 932 494

	9. Waste Shipping Name and Description	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	
	1. Nonhazardous, Non DOT regulated soil		DM		P	None
	2. Nonhazardous, NonDOT regulated petroleum contaminated soil		DM		P	None
	3.					
	4.					

13. Special Handling Instructions and Additional Information
1. NH soil borings CTO-174
2. NH soil and hydraulic oil
CESI Job# ROAN-TFORT-2985-16738

14. GENERATOR'S CERTIFICATION: I certify the materials described above on this manifest are not subject to federal regulations for reporting proper disposal of Hazardous Waste.

Generator's/Offeror's Printed/Typed Name | Signature | Month | Day | Year

15. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter Signature (for exports only): Date leaving U.S.:

16. Transporter Acknowledgment of Receipt of Materials
Transporter 1 Printed/Typed Name | Signature | Month | Day | Year
Transporter 2 Printed/Typed Name | Signature | Month | Day | Year

17. Discrepancy
17a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Manifest Reference Number:
17b. Alternate Facility (or Generator) | U.S. EPA ID Number
Facility's Phone:
17c. Signature of Alternate Facility (or Generator) | Month | Day | Year

18. Designated Facility Owner or Operator: Certification of receipt of materials covered by the manifest except as noted in Item 17a
Printed/Typed Name | Signature | Month | Day | Year

GENERATOR
INT'L
TRANSPORTER
DESIGNATED FACILITY

Appendix E
Data Quality Summary Tables

APPENDIX E

Data Quality Summary

E.1 Data Quality Assessment

This data quality summary assesses the effect of the overall analytical process on the availability of the analytical data for use by the project team.

The three major categories of data evaluation are laboratory performance, field collection performance (i.e., blank contamination), and matrix interference. Evaluation of laboratory performance is a check for the laboratory's compliance with the method requirements. Additionally, an independent, third-party validator conducts a review of the laboratory data to assess whether the analytical methods were within required control limits. Evaluation of field collection performance, such as blank contamination and field duplicates, involves the review of field quality control (QC) samples and the determination of their effect on the sample results. Evaluation of potential matrix interferences involves the review of several areas of results, including surrogate spike recoveries and matrix spike/ matrix spike duplicate (MS/MSD) sample results.

Independent, third-party data validators (DataQual Environmental Services and Environmental Data Services) reviewed all data packages using the validation criteria outlined in the UFP-QAPP (CH2M HILL, 2008). If adherence to QA/QC criteria yielded deficiencies, data was considered for qualification. The data qualifiers were those presented in *EPA CLP Region III Modifications to National Functional Guidelines for Organic Data Review: Multi-Media, Multi-Concentration* (Sept. 1994) and *EPA CLP Region III Modifications to National Functional Guidelines for Inorganic Data Review* (April 1993). These guidelines weren't used for data validation; however, the specific qualifiers listed therein may have been applied to data should nonconformances against the QA/QC criteria be identified.

In general, the data validator examines each data point and determines any effects that QC exceedances may have had. The following qualifiers may be applied to results:

- **J** - Concentration estimated. The analyte was positively identified and the associated numerical value is the approximate concentration of the parameter in the sample. Often, a J-qualifier is applied when the result was less than the quantitation limit (QL).
- **U** - Not detected. Sample was analyzed for this analyte, but it was not detected at greater than the QL.
- **UJ** – Not detected, QL estimated. Sample was analyzed for this analyte, but it was not detected above the QL. The QL for this parameter is estimated due to a QC exceedance.
- **R** – Rejected/ unreliable. The result was rejected because QC limits were exceeded. The presence or absence of the parameter cannot be verified and the result is not usable.
- **K -** Detected. Analyte is present but the result may be biased high. The actual result may be lower than the reported result.

- **L -** Detected. Analyte is present but the result may be biased low. The actual result may be higher than the reported result.
- **UL –** Not detected. The QL is probably higher than what was reported.
- **[No qualifier present] -** Detected. Qualification was not warranted.

See **Table E-1** for a description of data validation qualifiers that were applied to one or more analytical results.

E.2 Data Usability

As shown in **Table E-1**, several results were R-qualified by the data validators due to low MS/MSD recoveries, low spiked surrogate recoveries, and low continuing calibration verification recoveries. The specific samples and analytes that were R-qualified can be found in **Table E-2**. Very low or zero percent MS and MSD recoveries were present for some samples; interferences may be present in the sample matrix that caused target analytes to recover at lower concentrations than what's present in the sample. Additionally, there were several very low or zero percent recoveries for spiked surrogates. Spiked surrogates evaluate the ability to recover known concentrations of nontarget analytes with similar chemical properties to the target analytes. Poor recoveries are likely due to matrix interferences with the analytical method. Continuing calibration verification recoveries evaluate the instrument's ability to provide accurate/nonbiased results. R-qualifications for continuing calibration were due to low relative response factors (RRFs). All R-qualified results are considered unreliable and should not be used by the project team for making decisions.

Blank contamination present in laboratory and field-associated blanks resulted in B-qualification of 1.87 percent of the data. Blank contamination was most prevalent in total metals results. Approximately 55 percent of total metals B-qualifications can be attributed to contamination in laboratory blanks (method blanks, calibration blanks, etc.). The remaining B-qualifications can be attributed to field blanks and equipment rinseate blanks. Blank contamination was also present for dissolved metals, acid volatile sulfide/simultaneously extracted metals (AVS/SEM), and VOC (also includes trip blanks) analysis; laboratory blanks comprised at least 50 to 75 percent of the contamination for these analytical groups. Additionally, L/UL-qualified results with a data validation qualification code of BL can be attributed to contamination in laboratory blanks. B-qualified results are available for use by the project team as nondetects at the reported concentrations and are listed in **Table E-2**.

E.3 Impacts on Precision, Accuracy, Representativeness, Completeness, and Comparability

E.3.1 Precision

Precision is defined as the agreement between duplicate results and was characterized by comparing MS/MSD relative percent differences (RPDs), serial dilutions, laboratory replicates, and field duplicate sample results. For this data set, precision was also assessed by examining dual-column reproducibility (percent difference between instrument columns) for pesticides and explosives. Although results may have been qualified due to

QC exceedances that may suggest an impact on precision, there is no actual significant negative impact on precision unless a data point is deemed unusable (rejected) due to precision exceedances. Rejected data that had a negative impact on precision includes several explosives results which had high MS/MSD RPDs.

E.3.2 Accuracy/Bias

Accuracy/bias is a measure of the agreement between an analytical determination and the true value of the parameter being measured. For organic analyses, each sample was spiked with surrogate compounds; and for organic and inorganic analyses, an MS/MSD and laboratory control spike (LCS) were spiked with a known parameter concentration before preparation. Internal standards, surrogates and MS/MSDs provide a measure of the matrix effects on the analytical accuracy. The LCS demonstrates accuracy of the method and the laboratory's ability to meet the method criteria. Accuracy/bias is also assessed by calibration recoveries. Although results may have been qualified due to QC exceedances that may suggest an impact on accuracy/ bias, there is no actual significant negative impact on accuracy unless a data point is deemed unusable (rejected) due to accuracy exceedances. Rejection of results may have a negative impact on accuracy/bias due to low or zero percent MS and MSD recoveries, spiked surrogate recoveries, and continuing calibration verification RRFs.

E.3.3 Representativeness

Representativeness is a qualitative measure of the degree to which sample data accurately and precisely represent a characteristic environmental condition (in this case, the nature and extent of contamination). Representativeness is a subjective parameter and is used to evaluate the efficacy of the sample planning design. In terms of data quality, representativeness was assured because the sampling team followed approved SOPs for sample collection and handling and the laboratory followed approved SOPs for sample handling, preparation, and analysis.

E.3.4 Completeness

Completeness will be calculated as the number of analytically sound results that are available for use compared to the total number of measurements made. All results except those R-qualified as rejected are available for use as analytically sound results. The R-qualifier is the only qualifier that negatively affects a data point's availability. A completeness goal was not specified in the UFP-QAPP or Work Plan; therefore, a general 95 percent completeness goal was applied. Overall, the entire data set was 98.81 percent complete and the goal was met.

E.3.5 Comparability

Comparability is a qualitative measure designed to express the confidence with which one data set may be compared to another. Factors that affect comparability are sample collection and handling techniques, sample matrix, and analytical methods. In this case, because approved SOPs were used for sample collection and handling, common sample matrices were evaluated (surface water, sediment, soil, and groundwater), and USEPA Contract Laboratory Program (CLP) methods, USEPA SW-846 methods, and ASTM International (ASTM) methods were used, the data user may express confidence in the fact that this data set is comparable to others of acceptable data quality. In addition, comparability is

controlled by the other on Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) parameters because data sets can be compared with confidence only when precision and accuracy are known. Except in the case of rejected data, precision and accuracy were demonstrated to be acceptable, and the data user may be confident that this data set is comparable to others of high data quality.

E.4 Overall Assessment

All data collected during the CAX AOCs SI are found to be of acceptable quality. The data completeness goal was met with respect to the amount of data that is available for use by the project team. The project team can use this data as reported and qualified with the exception of data that was rejected due to QA/QC deficiencies.

All raw laboratory analytical data are included in Appendix F. Tables of detected constituents and screening value exceedances are included in the AOC-specific sections of this SI report (i.e., **Sections 3** through **7**).

TABLE E-1

Data Qualification and Availability Summary Table
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

DV Qualifier	DV Qualification Code	Meaning of Code	Analyte Count	Percent	Available as Reported	Available as Qualified	Not Available	Impact on PARCC
B	BL	Blank Contamination; Not detected substantially above the level reported in associated laboratory or field blanks	524	1.87%		X		
CLEAR	CLEAR	Detected	2,379	8.49%	X			
J	2C	Second Column – Poor Dual Column Reproducibility	80	0.29%		X		
J	BRL	Detected; Below Reporting Limit	1,191	4.25%	X			
J	SSH	Detected, but Estimated; Spiked Surrogate – High Recovery	2	0.01%		X		
J	CCH	Detected, but Estimated; Continuing Calibration Verification – High Recovery	14	0.05%		X		
J	SD	Detected, but Estimated; Poor Serial Dilution Reproducibility	98	0.35%		X		
J	MDP	Detected, but Estimated; Matrix Spike/Matrix Spike Duplicate (MS/MSD) Precision	107	0.38%		X		
J	FD	Detected, but Estimated; Poor Field Duplicate Reproducibility	38	0.14%		X		
J	HT	Detected, but Estimated; Exceeded Holding Time	1	0.004%		X		
J	ISL	Detected, but Estimated; Internal Standard – Low Recovery	8	0.03%		X		
J	LR	Detected, but Estimated; Concentration Exceeds Linear Range	1	0.004%		X		
K	SSH	Detected, but Potentially Biased High; Spiked Surrogate – High Recovery	2	0.01%		X		
K	MSH	Detected, but Potentially Biased High; MS and/or MSD – High Recovery	103	0.37%		X		
L	MSL	Detected, but Potentially Biased Low; MS and/or MSD – Low Recovery	224	0.80%		X		
L	BL	Blank Contamination; Result is detected but may be biased low due to potential contamination in associated laboratory or field blanks	22	0.08%		X		
L	SSL	Detected, but Potentially Biased Low; Spiked Surrogate – Low Recovery	9	0.03%		X		
R	MSL	Rejected; MS and/or MSD – Low Recovery	33	0.12%			X	Completeness Accuracy Precision
R	SSL	Rejected; Spiked Surrogate – Low Recovery	211	0.75%			X	Completeness
R	CCL	Rejected; Continuing Calibration Verification – Low Recovery	90	0.32%			X	Accuracy
U	CLEAR	Not detected	22,306	79.60%	X			
UJ	CCH	Not detected, QL may be inaccurate or imprecise; Continuing Calibration Verification – High Recovery	89	0.32%		X		
UJ	FD	Not detected, QL may be inaccurate or imprecise; Poor Field Duplicate Reproducibility	2	0.01%		X		
UJ	HT	Not detected, QL may be inaccurate or imprecise; Exceeded Holding Time	64	0.23%		X		

TABLE E-1

Data Qualification and Availability Summary Table
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

DV Qualifier	DV Qualification Code	Meaning of Code	Analyte Count	Percent	Available as Reported	Available as Qualified	Not Available	Impact on PARCC
UJ	ISL	Not detected, QL may be inaccurate or imprecise; Internal Standard – Low Recovery	36	0.13%		X		
UJ	MSL	Not detected, QL may be inaccurate or imprecise; Matrix Spike and/or Matrix Spike Duplicate – Low Recovery	22	0.08%		X		
UJ	SSH	Not detected, QL may be inaccurate or imprecise; Spiked Surrogate – High Recovery	50	0.18%		X		
UJ	SSL	Not detected, QL may be inaccurate or imprecise; Spiked Surrogate – Low Recovery	2	0.01%		X		
UL	MSL	Not detected, QL may be Biased Low; Matrix Spike and/or Matrix Spike Duplicate – Low Recovery	115	0.41%		X		
UL	BSL	Not detected, QL may be Biased Low; Blank Spike/LCS – Low Recovery	27	0.10%		X		
UL	BL	Blank Contamination; QL may be biased low due to potential contamination in associated laboratory or field blanks	117	0.42%		X		
UL	SSL	Not detected, QL may be Biased Low; Spiked Surrogate – Low Recovery	56	0.20%		X		
		TOTAL:	**28,023**	**100.00%**	**92.34%**	**6.47%**	**1.19%**	
					98.81% available for use, qualified as applicable (completeness goal of 95% available data met)		**Unavailable for use**	

"CLEAR" qualifiers indicate a detected result.

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
FMETAL	CAA01-DW01-1108	Zinc	7440-66-6	12.9	UG_L	B	B	BL
FMETAL	CAA01-DW01-1108	Arsenic	7440-38-2	6.5	UG_L	B	B	BL
FMETAL	CAA01-DW01-1108	Cadmium	7440-43-9	0.12	UG_L	B	B	BL
FMETAL	CAA01-DW01-1108	Copper	7440-50-8	2.8	UG_L	B	B	BL
FMETAL	CAA01-DW01-1108	Lead	7439-92-1	2.5	UG_L	B	B	BL
FMETAL	CAA01-DW01-1108	Nickel	7440-02-0	5.8	UG_L	B	B	BL
FMETAL	CAA01-DW01-1108	Thallium	7440-28-0	2.4	UG_L	B	B	BL
METAL	CAA01-DW01-1108	Arsenic	7440-38-2	61.7	UG_L	CLEAR	B	BL
METAL	CAA01-DW01-1108	Nickel	7440-02-0	20.2	UG_L	B	B	BL
METAL	CAA01-DW01-1108	Cadmium	7440-43-9	0.38	UG_L	B	B	BL
METAL	CAA01-DW01-1108	Thallium	7440-28-0	2.4	UG_L	B	B	BL
METAL	CAA01-DW01-1108	Selenium	7782-49-2	6.9	UG_L	B	B	BL
SVOA	CAA01-DW01-1108	4-Nitrophenol	100-02-7	24	UG_L	U	R	CCL
FMETAL	CAA01-DW02-1108	Nickel	7440-02-0	5.8	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Zinc	7440-66-6	5	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Thallium	7440-28-0	2.3	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Lead	7439-92-1	1.8	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Copper	7440-50-8	2.1	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Cadmium	7440-43-9	0.13	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Arsenic	7440-38-2	3.3	UG_L	B	B	BL
FMETAL	CAA01-DW02-1108	Vanadium	7440-62-2	0.42	UG_L	B	B	BL
METAL	CAA01-DW02-1108	Cadmium	7440-43-9	0.21	UG_L	B	B	BL
METAL	CAA01-DW02-1108	Chromium	7440-47-3	21.8	UG_L	CLEAR	B	BL
METAL	CAA01-DW02-1108	Copper	7440-50-8	11.1	UG_L	B	B	BL
METAL	CAA01-DW02-1108	Lead	7439-92-1	3.7	UG_L	B	B	BL
METAL	CAA01-DW02-1108	Nickel	7440-02-0	14	UG_L	B	B	BL
METAL	CAA01-DW02-1108	Thallium	7440-28-0	2.8	UG_L	B	B	BL
METAL	CAA01-DW02-1108	Zinc	7440-66-6	22.7	UG_L	B	B	BL
SVOA	CAA01-DW02-1108	4-Nitrophenol	100-02-7	25	UG_L	U	R	CCL
VOA	CAA01-DW02-1108	Acetone	67-64-1	3	UG_L	J	B	BL
FMETAL	CAA01-DW03-1108	Cadmium	7440-43-9	0.12	UG_L	J	B	BL
FMETAL	CAA01-DW03-1108	Copper	7440-50-8	2.5	UG_L	J	B	BL
FMETAL	CAA01-DW03-1108	Thallium	7440-28-0	3.4	UG_L	J	B	BL
METAL	CAA01-DW03-1108	Thallium	7440-28-0	7	UG_L	J	B	BL
SVOA	CAA01-DW03-1108	4-Nitrophenol	100-02-7	26	UG_L	U	R	CCL
FMETAL	CAA01-DW04-1108	Cadmium	7440-43-9	0.52	UG_L	J	B	BL
FMETAL	CAA01-DW04-1108	Copper	7440-50-8	1	UG_L	J	B	BL
FMETAL	CAA01-DW04-1108	Lead	7439-92-1	2.2	UG_L	J	B	BL
FMETAL	CAA01-DW04-1108	Silver	7440-22-4	0.43	UG_L	J	B	BL
FMETAL	CAA01-DW04-1108	Thallium	7440-28-0	2.4	UG_L	J	B	BL
METAL	CAA01-DW04-1108	Antimony	7440-36-0	60	UG_L	UN	R	MSL
METAL	CAA01-DW04-1108	Silver	7440-22-4	0.5	UG_L	J	B	BL
SVOA	CAA01-DW04-1108	4-Nitrophenol	100-02-7	25	UG_L	U	R	CCL
FMETAL	CAA01-DW04P-1108	Cadmium	7440-43-9	0.5	UG_L	J	B	BL
FMETAL	CAA01-DW04P-1108	Copper	7440-50-8	1.3	UG_L	J	B	BL
FMETAL	CAA01-DW04P-1108	Thallium	7440-28-0	2.9	UG_L	J	B	BL
METAL	CAA01-DW04P-1108	Antimony	7440-36-0	60	UG_L	UN	R	MSL
METAL	CAA01-DW04P-1108	Silver	7440-22-4	0.4	UG_L	J	B	BL
SVOA	CAA01-DW04P-1108	4-Nitrophenol	100-02-7	24	UG_L	U	R	CCL
FMETAL	CAA01-DW05-1208	Thallium	7440-28-0	4	UG_L	J	B	BL
FMETAL	CAA01-DW05-1208	Aluminum	7429-90-5	73.2	UG_L	J	B	BL
METAL	CAA01-DW05-1208	Arsenic	7440-38-2	12.1	UG_L	CLEAR	B	BL
METAL	CAA01-DW05-1208	Cadmium	7440-43-9	0.13	UG_L	J	B	BL
METAL	CAA01-DW05-1208	Cobalt	7440-48-4	0.3	UG_L	J	B	BL
METAL	CAA01-DW05-1208	Thallium	7440-28-0	4.3	UG_L	J	B	BL
VOA	CAA01-DW05-1208	Acetone	67-64-1	4	UG_L	J	B	BL
FMETAL	CAA01-DW05P-1208	Aluminum	7429-90-5	68.4	UG_L	J	B	BL
FMETAL	CAA01-DW05P-1208	Arsenic	7440-38-2	9.2	UG_L	J	B	BL
FMETAL	CAA01-DW05P-1208	Cadmium	7440-43-9	0.05	UG_L	J	B	BL
FMETAL	CAA01-DW05P-1208	Cobalt	7440-48-4	0.29	UG_L	J	B	BL
FMETAL	CAA01-DW05P-1208	Thallium	7440-28-0	4.4	UG_L	J	B	BL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
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WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
METAL	CAA01-DW05P-1208	Arsenic	7440-38-2	11.4	UG_L	CLEAR	B	BL
METAL	CAA01-DW05P-1208	Cadmium	7440-43-9	0.08	UG_L	J	B	BL
METAL	CAA01-DW05P-1208	Cobalt	7440-48-4	0.39	UG_L	J	B	BL
METAL	CAA01-DW05P-1208	Thallium	7440-28-0	4.2	UG_L	J	B	BL
VOA	CAA01-DW05P-1208	Acetone	67-64-1	4	UG_L	J	B	BL
FMETAL	CAA01-DW06-1208	Arsenic	7440-38-2	4.3	UG_L	J	B	BL
FMETAL	CAA01-DW06-1208	Cobalt	7440-48-4	0.25	UG_L	J	B	BL
FMETAL	CAA01-DW06-1208	Thallium	7440-28-0	5.3	UG_L	J	B	BL
METAL	CAA01-DW06-1208	Arsenic	7440-38-2	4.2	UG_L	J	B	BL
METAL	CAA01-DW06-1208	Cadmium	7440-43-9	0.07	UG_L	J	B	BL
METAL	CAA01-DW06-1208	Cobalt	7440-48-4	0.43	UG_L	J	B	BL
METAL	CAA01-DW06-1208	Iron	7439-89-6	21.6	UG_L	J	B	BL
METAL	CAA01-DW06-1208	Thallium	7440-28-0	3	UG_L	J	B	BL
VOA	CAA01-DW06-1208	Acetone	67-64-1	3	UG_L	J	B	BL
FMETAL	CAA01-DW07-1208	Arsenic	7440-38-2	9.2	UG_L	J	B	BL
FMETAL	CAA01-DW07-1208	Cadmium	7440-43-9	0.05	UG_L	J	B	BL
FMETAL	CAA01-DW07-1208	Cobalt	7440-48-4	0.32	UG_L	J	B	BL
METAL	CAA01-DW07-1208	Arsenic	7440-38-2	10.5	UG_L	CLEAR	B	BL
METAL	CAA01-DW07-1208	Cadmium	7440-43-9	0.07	UG_L	J	B	BL
METAL	CAA01-DW07-1208	Cobalt	7440-48-4	0.87	UG_L	J	B	BL
METAL	CAA01-DW07-1208	Thallium	7440-28-0	4.1	UG_L	J	B	BL
VOA	CAA01-DW07-1208	Acetone	67-64-1	2	UG_L	J	B	BL
SVOA	CAA01-SB01-1108	4-Nitrophenol	100-02-7	1100	UG_KG	U	R	CCL
VOA	CAA01-SB01-1108	Acetone	67-64-1	10	UG_KG	JB	B	BL
VOA	CAA01-SB01-1108	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA01-SB02-1108	Acetone	67-64-1	12	UG_KG	B	B	BL
VOA	CAA01-SB02P-1108	Acetone	67-64-1	6	UG_KG	JB	B	BL
METAL	CAA01-SB03-1108	Sodium	7440-23-5	28.5	MG_KG	J	B	BL
SVOA	CAA01-SB03-1108	4-Nitrophenol	100-02-7	900	UG_KG	U	R	CCL
VOA	CAA01-SB03-1108	1,2-Dibromo-3-chloropropane	96-12-8	11	UG_KG	U	R	CCL
VOA	CAA01-SB03-1108	Acetone	67-64-1	2	UG_KG	JB	B	BL
VOA	CAA01-SB03-1108	Methylene chloride	75-09-2	8	UG_KG	JB	B	BL
VOA	CAA01-SB04-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
METAL	CAA01-SB05-1108	Cadmium	7440-43-9	0.02	MG_KG	J	B	BL
VOA	CAA01-SB05-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
METAL	CAA01-SB06-1108	Thallium	7440-28-0	0.2	MG_KG	J	B	BL
SVOA	CAA01-SB06-1108	4-Nitrophenol	100-02-7	980	UG_KG	U	R	CCL
VOA	CAA01-SB06-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SB06-1108	Methylene chloride	75-09-2	9	UG_KG	JB	B	BL
METAL	CAA01-SB06P-1108	Copper	7440-50-8	1.8	MG_KG	J	B	BL
METAL	CAA01-SB06P-1108	Sodium	7440-23-5	26.2	MG_KG	J	B	BL
METAL	CAA01-SB06P-1108	Thallium	7440-28-0	0.18	MG_KG	J	B	BL
SVOA	CAA01-SB06P-1108	4-Nitrophenol	100-02-7	980	UG_KG	U	R	CCL
VOA	CAA01-SB06P-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SB06P-1108	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA01-SB07-1108	Cadmium	7440-43-9	0.02	MG_KG	J	B	BL
METAL	CAA01-SB07-1108	Sodium	7440-23-5	20.7	MG_KG	J	B	BL
SVOA	CAA01-SB07-1108	4-Nitrophenol	100-02-7	1100	UG_KG	U	R	CCL
VOA	CAA01-SB07-1108	1,2-Dibromo-3-chloropropane	96-12-8	13	UG_KG	U	R	CCL
VOA	CAA01-SB07-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
VOA	CAA01-SB07-1108	Methylene chloride	75-09-2	12	UG_KG	JB	B	BL
METAL	CAA01-SB08-1108	Sodium	7440-23-5	27.8	MG_KG	J	B	BL
SVOA	CAA01-SB08-1108	4-Nitrophenol	100-02-7	930	UG_KG	U	R	CCL
VOA	CAA01-SB08-1108	1,2-Dibromo-3-chloropropane	96-12-8	11	UG_KG	U	R	CCL
VOA	CAA01-SB08-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SB08-1108	Methylene chloride	75-09-2	13	UG_KG	B	B	BL
METAL	CAA01-SB09-1108	Sodium	7440-23-5	12.4	MG_KG	J	B	BL
SVOA	CAA01-SB09-1108	4-Nitrophenol	100-02-7	880	UG_KG	U	R	CCL
VOA	CAA01-SB09-1108	1,2-Dibromo-3-chloropropane	96-12-8	10	UG_KG	U	R	CCL
VOA	CAA01-SB09-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SB09-1108	Methylene chloride	75-09-2	10	UG_KG	JB	B	BL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
METAL	CAA01-SB10-1108	Sodium	7440-23-5	25.7	MG_KG	J	B	BL
METAL	CAA01-SB10-1108	Thallium	7440-28-0	0.21	MG_KG	J	B	BL
VOA	CAA01-SB10-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SB10-1108	Acetone	67-64-1	2	UG_KG	JB	B	BL
VOA	CAA01-SB10-1108	Methylene chloride	75-09-2	8	UG_KG	JB	B	BL
METAL	CAA01-SB12-1108	Cadmium	7440-43-9	0.03	MG_KG	J	B	BL
METAL	CAA01-SB12-1108	Mercury	7439-97-6	0.05	MG_KG	J	B	BL
METAL	CAA01-SB12-1108	Sodium	7440-23-5	10.2	MG_KG	J	B	BL
VOA	CAA01-SB12-1108	1,2-Dibromo-3-chloropropane	96-12-8	10	UG_KG	U	R	CCL
VOA	CAA01-SB12-1108	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
VOA	CAA01-SB12-1108	Acetone	67-64-1	18	UG_KG	B	B	BL
METAL	CAA01-SB13-1108	Cadmium	7440-43-9	0.04	MG_KG	J	B	BL
METAL	CAA01-SB13-1108	Mercury	7439-97-6	0.06	MG_KG	J	B	BL
METAL	CAA01-SB13-1108	Sodium	7440-23-5	25.4	MG_KG	J	B	BL
VOA	CAA01-SB13-1108	1,2-Dibromo-3-chloropropane	96-12-8	13	UG_KG	U	R	CCL
VOA	CAA01-SB13-1108	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
VOA	CAA01-SB13-1108	Acetone	67-64-1	12	UG_KG	JB	B	BL
METAL	CAA01-SB14-1108	Thallium	7440-28-0	0.07	MG_KG	J	B	BL
METAL	CAA01-SB14-1108	Sodium	7440-23-5	46.7	MG_KG	J	B	BL
VOA	CAA01-SB14-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SB14-1108	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
VOA	CAA01-SB15-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
METAL	CAA01-SB15-1108	Sodium	7440-23-5	59.2	MG_KG	J	B	BL
VOA	CAA01-SB15-1108	Acetone	67-64-1	9	UG_KG	JB	B	BL
VOA	CAA01-SB15-1108	Methylene chloride	75-09-2	9	UG_KG	JB	B	BL
METAL	CAA01-SB16-1108	Mercury	7439-97-6	0.04	MG_KG	J	B	BL
METAL	CAA01-SB16-1108	Sodium	7440-23-5	19.1	MG_KG	J	B	BL
METAL	CAA01-SB16-1108	Thallium	7440-28-0	0.14	MG_KG	J	B	BL
VOA	CAA01-SB16-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SB16-1108	Acetone	67-64-1	6	UG_KG	JB	B	BL
VOA	CAA01-SB16-1108	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA01-SB17-1208	Thallium	7440-28-0	0.16	MG_KG	J	B	BL
VOA	CAA01-SB17-1208	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA01-SB18-1208	Thallium	7440-28-0	0.25	MG_KG	J	B	BL
METAL	CAA01-SB18-1208	Sodium	7440-23-5	23.1	MG_KG	J	B	BL
VOA	CAA01-SB18-1208	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA01-SB18P-1208	Thallium	7440-28-0	0.09	MG_KG	J	B	BL
VOA	CAA01-SB18P-1208	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA01-SB19-1208	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA01-SS01-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
SVOA	CAA01-SS02-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA01-SS02-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SS02P-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
METAL	CAA01-SS03-1108	Thallium	7440-28-0	0.12	MG_KG	J	B	BL
METAL	CAA01-SS03-1108	Cadmium	7440-43-9	0.01	MG_KG	J	B	BL
METAL	CAA01-SS03-1108	Sodium	7440-23-5	31.4	MG_KG	J	B	BL
SVOA	CAA01-SS03-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA01-SS03-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SS03-1108	Methylene chloride	75-09-2	7	UG_KG	JB	B	BL
VOA	CAA01-SS03-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SS04-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
VOA	CAA01-SS05-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
METAL	CAA01-SS06-1108	Thallium	7440-28-0	0.26	MG_KG	J	B	BL
SVOA	CAA01-SS06-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA01-SS06-1108	Acetone	67-64-1	2	UG_KG	JB	B	BL
VOA	CAA01-SS06-1108	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
METAL	CAA01-SS06P-1108	Thallium	7440-28-0	0.13	MG_KG	J	B	BL
METAL	CAA01-SS06P-1108	Sodium	7440-23-5	21	MG_KG	J	B	BL
SVOA	CAA01-SS06P-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA01-SS06P-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
VOA	CAA01-SS06P-1108	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
METAL	CAA01-SS07-1108	Cadmium	7440-43-9	0.03	MG_KG	J	B	BL
METAL	CAA01-SS07-1108	Sodium	7440-23-5	25.8	MG_KG	J	B	BL
SVOA	CAA01-SS07-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA01-SS07-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SS07-1108	Acetone	67-64-1	5	UG_KG	JB	B	BL
VOA	CAA01-SS07-1108	Methylene chloride	75-09-2	13	UG_KG	B	B	BL
METAL	CAA01-SS08-1108	Sodium	7440-23-5	29.6	MG_KG	J	B	BL
METAL	CAA01-SS08-1108	Cadmium	7440-43-9	0.04	MG_KG	J	B	BL
METAL	CAA01-SS08-1108	Mercury	7439-97-6	0.04	MG_KG	J	B	BL
SVOA	CAA01-SS08-1108	4-Nitrophenol	100-02-7	960	UG_KG	U	R	CCL
VOA	CAA01-SS08-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SS08-1108	Methylene chloride	75-09-2	13	UG_KG	B	B	BL
VOA	CAA01-SS08-1108	Acetone	67-64-1	4	UG_KG	JB	B	BL
METAL	CAA01-SS09-1108	Mercury	7439-97-6	0.05	MG_KG	J	B	BL
METAL	CAA01-SS09-1108	Sodium	7440-23-5	17.7	MG_KG	J	B	BL
SVOA	CAA01-SS09-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA01-SS09-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SS09-1108	Methylene chloride	75-09-2	11	UG_KG	JB	B	BL
VOA	CAA01-SS09-1108	Acetone	67-64-1	8	UG_KG	JB	B	BL
METAL	CAA01-SS10-1108	Sodium	7440-23-5	15.4	MG_KG	J	B	BL
METAL	CAA01-SS10-1108	Thallium	7440-28-0	0.08	MG_KG	J	B	BL
VOA	CAA01-SS10-1108	1,2-Dibromo-3-chloropropane	96-12-8	13	UG_KG	U	R	CCL
VOA	CAA01-SS10-1108	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA01-SS10-1108	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
METAL	CAA01-SS11-1108	Sodium	7440-23-5	64.1	MG_KG	J	B	BL
VOA	CAA01-SS11-1108	1,2-Dibromo-3-chloropropane	96-12-8	17	UG_KG	U	R	CCL
VOA	CAA01-SS11-1108	Acetone	67-64-1	10	UG_KG	JB	B	BL
VOA	CAA01-SS11-1108	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA01-SS12-1108	Mercury	7439-97-6	0.09	MG_KG	J	B	BL
METAL	CAA01-SS12-1108	Sodium	7440-23-5	22.3	MG_KG	J	B	BL
VOA	CAA01-SS12-1108	1,2-Dibromo-3-chloropropane	96-12-8	14	UG_KG	U	R	CCL
VOA	CAA01-SS12-1108	Acetone	67-64-1	9	UG_KG	JB	B	BL
VOA	CAA01-SS12-1108	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA01-SS13-1108	Sodium	7440-23-5	32.6	MG_KG	J	B	BL
VOA	CAA01-SS13-1108	1,2-Dibromo-3-chloropropane	96-12-8	13	UG_KG	U	R	CCL
VOA	CAA01-SS13-1108	Acetone	67-64-1	14	UG_KG	B	B	BL
VOA	CAA01-SS13-1108	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA01-SS14-1108	Selenium	7782-49-2	0.51	MG_KG	J	B	BL
METAL	CAA01-SS14-1108	Sodium	7440-23-5	49.2	MG_KG	J	B	BL
METAL	CAA01-SS14-1108	Mercury	7439-97-6	0.08	MG_KG	J	B	BL
VOA	CAA01-SS14-1108	1,2-Dibromo-3-chloropropane	96-12-8	13	UG_KG	U	R	CCL
VOA	CAA01-SS14-1108	Acetone	67-64-1	10	UG_KG	JB	B	BL
VOA	CAA01-SS14-1108	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA01-SS15-1108	Selenium	7782-49-2	0.95	MG_KG	J	B	BL
METAL	CAA01-SS15-1108	Sodium	7440-23-5	32.1	MG_KG	J	B	BL
VOA	CAA01-SS15-1108	1,2-Dibromo-3-chloropropane	96-12-8	15	UG_KG	U	R	CCL
VOA	CAA01-SS15-1108	Acetone	67-64-1	95	UG_KG	B	B	BL
VOA	CAA01-SS15-1108	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA01-SS16-1108	Sodium	7440-23-5	23.3	MG_KG	J	B	BL
METAL	CAA01-SS16-1108	Mercury	7439-97-6	0.05	MG_KG	J	B	BL
VOA	CAA01-SS16-1108	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA01-SS16-1108	Acetone	67-64-1	8	UG_KG	JB	B	BL
VOA	CAA01-SS16-1108	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
METAL	CAA01-SS17-1208	Thallium	7440-28-0	0.15	MG_KG	J	B	BL
METAL	CAA01-SS17-1208	Sodium	7440-23-5	28.7	MG_KG	J	B	BL
VOA	CAA01-SS17-1208	Acetone	67-64-1	7	UG_KG	J	B	BL
METAL	CAA01-SS18-1208	Sodium	7440-23-5	23.6	MG_KG	J	B	BL
METAL	CAA01-SS18-1208	Thallium	7440-28-0	0.2	MG_KG	J	B	BL
VOA	CAA01-SS18-1208	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA01-SS18P-1208	Sodium	7440-23-5	26.1	MG_KG	J	B	BL
METAL	CAA01-SS18P-1208	Thallium	7440-28-0	0.12	MG_KG	J	B	BL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
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Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
VOA	CAA01-SS18P-1208	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA01-SS18P-1208	Acetone	67-64-1	15	UG_KG	J	B	BL
METAL	CAA01-SS19-1208	Sodium	7440-23-5	18.9	MG_KG	J	B	BL
METAL	CAA01-SS19-1208	Thallium	7440-28-0	0.18	MG_KG	J	B	BL
VOA	CAA01-SS19-1208	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
FMETAL	CAA06-DW01-1108	Nickel	7440-02-0	2.4	UG_L	J	B	BL
FMETAL	CAA06-DW01-1108	Silver	7440-22-4	0.6	UG_L	J	B	BL
FMETAL	CAA06-DW01-1108	Zinc	7440-66-6	5	UG_L	J	B	BL
FMETAL	CAA06-DW01-1108	Cadmium	7440-43-9	0.32	UG_L	J	B	BL
FMETAL	CAA06-DW01-1108	Thallium	7440-28-0	1.8	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Antimony	7440-36-0	60	UG_L	UN	R	MSL
METAL	CAA06-DW01-1108	Zinc	7440-66-6	15.1	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Thallium	7440-28-0	2.5	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Silver	7440-22-4	0.4	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Nickel	7440-02-0	5.3	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Lead	7439-92-1	4.7	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Copper	7440-50-8	7.4	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Chromium	7440-47-3	8.6	UG_L	J	B	BL
METAL	CAA06-DW01-1108	Cadmium	7440-43-9	0.47	UG_L	J	B	BL
FMETAL	CAA06-DW02-1108	Thallium	7440-28-0	2.1	UG_L	J	B	BL
FMETAL	CAA06-DW02-1108	Silver	7440-22-4	0.73	UG_L	J	B	BL
FMETAL	CAA06-DW02-1108	Aluminum	7429-90-5	59.8	UG_L	J	B	BL
FMETAL	CAA06-DW02-1108	Cadmium	7440-43-9	0.38	UG_L	J	B	BL
METAL	CAA06-DW02-1108	Antimony	7440-36-0	60	UG_L	U	R	MSL
METAL	CAA06-DW02-1108	Silver	7440-22-4	1.2	UG_L	J	B	BL
METAL	CAA06-DW02-1108	Copper	7440-50-8	17	UG_L	J	B	BL
FMETAL	CAA06-DW03-1108	Zinc	7440-66-6	2.2	UG_L	J	B	BL
FMETAL	CAA06-DW03-1108	Thallium	7440-28-0	1.8	UG_L	J	B	BL
FMETAL	CAA06-DW03-1108	Silver	7440-22-4	0.76	UG_L	J	B	BL
FMETAL	CAA06-DW03-1108	Cadmium	7440-43-9	0.6	UG_L	J	B	BL
FMETAL	CAA06-DW03-1108	Aluminum	7429-90-5	115	UG_L	J	B	BL
METAL	CAA06-DW03-1108	Antimony	7440-36-0	60	UG_L	U	R	MSL
METAL	CAA06-DW03-1108	Copper	7440-50-8	8.4	UG_L	J	B	BL
METAL	CAA06-DW03-1108	Silver	7440-22-4	0.52	UG_L	J	B	BL
FMETAL	CAA06-DW04-1108	Copper	7440-50-8	1	UG_L	J	B	BL
FMETAL	CAA06-DW04-1108	Aluminum	7429-90-5	45.6	UG_L	J	B	BL
FMETAL	CAA06-DW04-1108	Silver	7440-22-4	0.66	UG_L	J	B	BL
FMETAL	CAA06-DW04-1108	Cadmium	7440-43-9	0.2	UG_L	J	B	BL
METAL	CAA06-DW04-1108	Antimony	7440-36-0	60	UG_L	U	R	MSL
METAL	CAA06-DW04-1108	Silver	7440-22-4	0.59	UG_L	J	B	BL
METAL	CAA06-DW04-1108	Copper	7440-50-8	8.2	UG_L	J	B	BL
METAL	CAA06-DW04-1108	Cadmium	7440-43-9	0.34	UG_L	J	B	BL
METAL	CAA06-DW04-1108	Arsenic	7440-38-2	4.8	UG_L	J	B	BL
FMETAL	CAA06-DW04P-1108	Aluminum	7429-90-5	39.5	UG_L	J	B	BL
FMETAL	CAA06-DW04P-1108	Cadmium	7440-43-9	0.18	UG_L	J	B	BL
FMETAL	CAA06-DW04P-1108	Silver	7440-22-4	0.58	UG_L	J	B	BL
METAL	CAA06-DW04P-1108	Antimony	7440-36-0	60	UG_L	U	R	MSL
METAL	CAA06-DW04P-1108	Silver	7440-22-4	0.91	UG_L	J	B	BL
METAL	CAA06-DW04P-1108	Copper	7440-50-8	8.1	UG_L	J	B	BL
METAL	CAA06-DW04P-1108	Arsenic	7440-38-2	6.8	UG_L	J	B	BL
FMETAL	CAA06-DW05-1108	Cadmium	7440-43-9	0.35	UG_L	J	B	BL
FMETAL	CAA06-DW06-1108	Aluminum	7429-90-5	68.5	UG_L	J	B	BL
METAL	CAA06-DW06-1108	Cadmium	7440-43-9	0.05	UG_L	J	B	BL
METAL	CAA06-DW07-1108	Cadmium	7440-43-9	0.39	UG_L	J	B	BL
FMETAL	CAA06-DW08-1108	Aluminum	7429-90-5	71.4	UG_L	J	B	BL
FMETAL	CAA06-DW08-1108	Nickel	7440-02-0	1.1	UG_L	J	B	BL
METAL	CAA06-DW08-1108	Nickel	7440-02-0	3.4	UG_L	J	B	BL
FMETAL	CAA06-DW09-1108	Cobalt	7440-48-4	0.92	UG_L	J	B	BL
FMETAL	CAA06-DW09-1108	Arsenic	7440-38-2	4.6	UG_L	J	B	BL
SVOA	CAA06-DW09-1108	4-Nitrophenol	100-02-7	24	UG_L	U	R	CCL
FMETAL	CAA06-DW10-1108	Iron	7439-89-6	39.6	UG_L	J	B	BL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
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Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
FMETAL	CAA06-DW10-1108	Arsenic	7440-38-2	4.5	UG_L	J	B	BL
FMETAL	CAA06-DW10-1108	Cadmium	7440-43-9	0.09	UG_L	J	B	BL
FMETAL	CAA06-DW10-1108	Cobalt	7440-48-4	0.66	UG_L	J	B	BL
SVOA	CAA06-DW10-1108	4-Nitrophenol	100-02-7	24	UG_L	U	R	CCL
FMETAL	CAA06-DW10P-1108	Iron	7439-89-6	18.2	UG_L	J	B	BL
FMETAL	CAA06-DW10P-1108	Cobalt	7440-48-4	0.7	UG_L	J	B	BL
FMETAL	CAA06-DW10P-1108	Arsenic	7440-38-2	3.6	UG_L	J	B	BL
SVOA	CAA06-DW10P-1108	4-Nitrophenol	100-02-7	24	UG_L	U	R	CCL
FMETAL	CAA06-DW11-1108	Arsenic	7440-38-2	3.3	UG_L	J	B	BL
FMETAL	CAA06-DW11-1108	Cadmium	7440-43-9	0.07	UG_L	J	B	BL
FMETAL	CAA06-DW11-1108	Chromium	7440-47-3	0.58	UG_L	J	B	BL
FMETAL	CAA06-DW11-1108	Cobalt	7440-48-4	0.56	UG_L	J	B	BL
SVOA	CAA06-DW11-1108	4-Nitrophenol	100-02-7	24	UG_L	U	R	CCL
METAL	CAA06-SB07-1108	Sodium	7440-23-5	15.2	MG_KG	J	B	BL
METAL	CAA06-SB07-1108	Copper	7440-50-8	1.5	MG_KG	J	B	BL
SVOA	CAA06-SB07-1108	4-Nitrophenol	100-02-7	990	UG_KG	U	R	CCL
METAL	CAA06-SB08-1108	Thallium	7440-28-0	0.12	MG_KG	J	B	BL
METAL	CAA06-SB08-1108	Sodium	7440-23-5	33.2	MG_KG	J	B	BL
METAL	CAA06-SB08-1108	Copper	7440-50-8	2.7	MG_KG	CLEAR	B	BL
SVOA	CAA06-SB08-1108	4-Nitrophenol	100-02-7	930	UG_KG	U	R	CCL
METAL	CAA06-SB09-1108	Cadmium	7440-43-9	0.02	MG_KG	J	B	BL
METAL	CAA06-SB09-1108	Copper	7440-50-8	3	MG_KG	CLEAR	B	BL
METAL	CAA06-SB09-1108	Sodium	7440-23-5	22.1	MG_KG	J	B	BL
SVOA	CAA06-SB09-1108	4-Nitrophenol	100-02-7	920	UG_KG	U	R	CCL
METAL	CAA06-SB09P-1108	Cadmium	7440-43-9	0.02	MG_KG	J	B	BL
METAL	CAA06-SB09P-1108	Copper	7440-50-8	3.1	MG_KG	CLEAR	B	BL
METAL	CAA06-SB09P-1108	Sodium	7440-23-5	23.6	MG_KG	J	B	BL
SVOA	CAA06-SB09P-1108	4-Nitrophenol	100-02-7	920	UG_KG	U	R	CCL
METAL	CAA06-SB10-1108	Thallium	7440-28-0	0.22	MG_KG	J	B	BL
METAL	CAA06-SB10-1108	Copper	7440-50-8	4.8	MG_KG	CLEAR	B	BL
SVOA	CAA06-SB10-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
METAL	CAA06-SB11-1108	Copper	7440-50-8	4.5	MG_KG	CLEAR	B	BL
METAL	CAA06-SB11-1108	Sodium	7440-23-5	13	MG_KG	J	B	BL
METAL	CAA06-SB12-1108	Copper	7440-50-8	1.8	MG_KG	J	B	BL
METAL	CAA06-SB12-1108	Sodium	7440-23-5	18.9	MG_KG	J	B	BL
SVOA	CAA06-SB12-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
METAL	CAA06-SB13-1108	Copper	7440-50-8	4.8	MG_KG	CLEAR	B	BL
METAL	CAA06-SB13-1108	Sodium	7440-23-5	25.8	MG_KG	J	B	BL
METAL	CAA06-SB13-1108	Thallium	7440-28-0	0.11	MG_KG	J	B	BL
SVOA	CAA06-SB13-1108	4-Nitrophenol	100-02-7	930	UG_KG	U	R	CCL
SVOA	CAA06-SB16-1108	Indeno(1,2,3-cd)pyrene	193-39-5	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Benzo(a)pyrene	50-32-8	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Benzo(k)fluoranthene	207-08-9	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Dibenz(a,h)anthracene	53-70-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Di-n-octylphthalate	117-84-0	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Benzo(g,h,i)perylene	191-24-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	bis(2-Ethylhexyl)phthalate	117-81-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Benzaldehyde	100-52-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,4-Dimethylphenol	105-67-9	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2-Nitroaniline	88-74-4	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2-Chloronaphthalene	91-58-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	1,1-Biphenyl	92-52-4	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,4,5-Trichlorophenol	95-95-4	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,4,6-Trichlorophenol	88-06-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Hexachlorocyclopentadiene	77-47-4	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2-Methylnaphthalene	91-57-6	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Chloro-3-methylphenol	59-50-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Caprolactam	105-60-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Hexachlorobutadiene	87-68-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Chloroaniline	106-47-8	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Naphthalene	91-20-3	380	UG_KG	U	R	SSL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
SVOA	CAA06-SB16-1108	Benzo(b)fluoranthene	205-99-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	bis(2-Chloroethoxy)methane	111-91-1	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Acenaphthylene	208-96-8	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2-Nitrophenol	88-75-5	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Isophorone	78-59-1	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Nitrobenzene	98-95-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Hexachloroethane	67-72-1	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	n-Nitroso-di-n-propylamine	621-64-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Methylphenol	106-44-5	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Acetophenone	98-86-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	bis(2-Chloroisopropyl)ether	108-60-1	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2-Methylphenol	95-48-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2-Chlorophenol	95-57-8	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	bis(2-Chloroethyl)ether	111-44-4	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Phenol	108-95-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,4-Dichlorophenol	120-83-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Bromophenyl-phenylether	101-55-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Chrysene	218-01-9	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Benzo(a)anthracene	56-55-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	3,3'-Dichlorobenzidine	91-94-1	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Butylbenzylphthalate	85-68-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Pyrene	129-00-0	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Fluoranthene	206-44-0	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Di-n-butylphthalate	84-74-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Carbazole	86-74-8	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Anthracene	120-12-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Phenanthrene	85-01-8	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Pentachlorophenol	87-86-5	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	DIMETHYL PHTHALATE	131-11-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Hexachlorobenzene	118-74-1	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,4-Dinitrotoluene	121-14-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	3-Nitroaniline	99-09-2	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Acenaphthene	83-32-9	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,4-Dinitrophenol	51-28-5	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Atrazine	1912-24-9	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Dibenzofuran	132-64-9	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	2,6-Dinitrotoluene	606-20-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Diethylphthalate	84-66-2	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	Fluorene	86-73-7	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Chlorophenyl-phenylether	7005-72-3	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Nitroaniline	100-01-6	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4,6-Dinitro-2-methylphenol	534-52-1	950	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	n-Nitrosodiphenylamine	86-30-6	380	UG_KG	U	R	SSL
SVOA	CAA06-SB16-1108	4-Nitrophenol	100-02-7	950	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2,4,5-Trichlorophenol	95-95-4	880	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	Pentachlorophenol	87-86-5	880	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2,4-Dimethylphenol	105-67-9	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	Phenol	108-95-2	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2-Chlorophenol	95-57-8	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2-Methylphenol	95-48-7	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2-Nitrophenol	88-75-5	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	4,6-Dinitro-2-methylphenol	534-52-1	880	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2,4-Dichlorophenol	120-83-2	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	4-Chloro-3-methylphenol	59-50-7	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2,4,6-Trichlorophenol	88-06-2	350	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	2,4-Dinitrophenol	51-28-5	880	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	4-Nitrophenol	100-02-7	880	UG_KG	U	R	SSL
SVOA	CAA06-SB18-1108	4-Methylphenol	106-44-5	350	UG_KG	U	R	SSL
AVSSEM	CAA06-SD01-1008	MERCURY, SEM	7439-97-6	0.00007	MG_KG	UN	R	MSL
AVSSEM	CAA06-SD01P-1008	MERCURY, SEM	7439-97-6	0.0000281	MG_KG	UN	R	MSL
AVSSEM	CAA06-SD02-1008	MERCURY, SEM	7439-97-6	0.0000293	MG_KG	UN	R	MSL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
EXPLO	CAA06-SD02-1008	Nitroglycerin	55-63-0	2.5	MG_KG	U	R	SSL
EXPLO	CAA06-SS01-1008	2,6-Dinitrotoluene	606-20-2	0.1	MG_KG	U	R	MSL
EXPLO	CAA06-SS01-1008	2-Nitrotoluene	88-72-2	0.2	MG_KG	U	R	MSL
EXPLO	CAA06-SS01-1008	3-Nitrotoluene	99-08-1	0.2	MG_KG	U	R	MSL
EXPLO	CAA06-SS01-1008	4-Nitrotoluene	99-99-0	0.2	MG_KG	U	R	MSL
EXPLO	CAA06-SS01-1008	4-Amino-2,6-dinitrotoluene	19406-51-0	0.1	MG_KG	U	R	MSL
SVOA	CAA06-SS06P-1008	4-Nitroaniline	100-01-6	940	UG_KG	U	R	CCL
METAL	CAA06-SS07-1108	Sodium	7440-23-5	19	MG_KG	J	B	BL
METAL	CAA06-SS07-1108	Copper	7440-50-8	2.2	MG_KG	CLEAR	B	BL
SVOA	CAA06-SS07-1108	4-Nitrophenol	100-02-7	1200	UG_KG	U	R	CCL
METAL	CAA06-SS08-1108	Copper	7440-50-8	4.8	MG_KG	CLEAR	B	BL
METAL	CAA06-SS08-1108	Cadmium	7440-43-9	0.05	MG_KG	J	B	BL
METAL	CAA06-SS08-1108	Sodium	7440-23-5	36.3	MG_KG	J	B	BL
SVOA	CAA06-SS08-1108	4-Nitrophenol	100-02-7	1100	UG_KG	U	R	CCL
METAL	CAA06-SS09-1108	Sodium	7440-23-5	31.4	MG_KG	J	B	BL
METAL	CAA06-SS09-1108	Copper	7440-50-8	4.6	MG_KG	CLEAR	B	BL
SVOA	CAA06-SS09-1108	4-Nitrophenol	100-02-7	1200	UG_KG	U	R	CCL
METAL	CAA06-SS09P-1108	Sodium	7440-23-5	29.2	MG_KG	J	B	BL
METAL	CAA06-SS09P-1108	Copper	7440-50-8	4.7	MG_KG	CLEAR	B	BL
SVOA	CAA06-SS09P-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
METAL	CAA06-SS10-1108	Thallium	7440-28-0	0.16	MG_KG	J	B	BL
METAL	CAA06-SS10-1108	Copper	7440-50-8	6.3	MG_KG	CLEAR	B	BL
METAL	CAA06-SS10-1108	Cadmium	7440-43-9	0.04	MG_KG	J	B	BL
METAL	CAA06-SS10-1108	Sodium	7440-23-5	45	MG_KG	J	B	BL
SVOA	CAA06-SS10-1108	4-Nitrophenol	100-02-7	1300	UG_KG	U	R	CCL
METAL	CAA06-SS11-1108	Copper	7440-50-8	3	MG_KG	CLEAR	B	BL
METAL	CAA06-SS11-1108	Sodium	7440-23-5	21.3	MG_KG	J	B	BL
METAL	CAA06-SS11-1108	Cadmium	7440-43-9	0.03	MG_KG	J	B	BL
SVOA	CAA06-SS11-1108	4-Nitrophenol	100-02-7	1100	UG_KG	U	R	CCL
METAL	CAA06-SS12-1108	Sodium	7440-23-5	20.4	MG_KG	J	B	BL
METAL	CAA06-SS12-1108	Copper	7440-50-8	4.1	MG_KG	CLEAR	B	BL
METAL	CAA06-SS12-1108	Thallium	7440-28-0	0.13	MG_KG	J	B	BL
SVOA	CAA06-SS12-1108	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
METAL	CAA06-SS13-1108	Thallium	7440-28-0	0.09	MG_KG	J	B	BL
METAL	CAA06-SS13-1108	Sodium	7440-23-5	27.2	MG_KG	J	B	BL
METAL	CAA06-SS13-1108	Copper	7440-50-8	4.2	MG_KG	CLEAR	B	BL
METAL	CAA06-SS13-1108	Cadmium	7440-43-9	0.02	MG_KG	J	B	BL
SVOA	CAA06-SS13-1108	4-Nitrophenol	100-02-7	940	UG_KG	U	R	CCL
SVOA	CAA06-SS17-1108	Fluoranthene	206-44-0	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Di-n-butylphthalate	84-74-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Carbazole	86-74-8	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Anthracene	120-12-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Phenanthrene	85-01-8	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Pentachlorophenol	87-86-5	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Atrazine	1912-24-9	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Hexachlorobenzene	118-74-1	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4,6-Dinitro-2-methylphenol	534-52-1	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	n-Nitrosodiphenylamine	86-30-6	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Benzo(b)fluoranthene	205-99-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Nitroaniline	100-01-6	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Chlorophenyl-phenylether	7005-72-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Bromophenyl-phenylether	101-55-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Pyrene	129-00-0	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Butylbenzylphthalate	85-68-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	3,3'-Dichlorobenzidine	91-94-1	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Benzo(a)anthracene	56-55-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Chrysene	218-01-9	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Di-n-octylphthalate	117-84-0	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Benzo(k)fluoranthene	207-08-9	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Benzo(a)pyrene	50-32-8	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Indeno(1,2,3-cd)pyrene	193-39-5	390	UG_KG	U	R	SSL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
SVOA	CAA06-SS17-1108	Dibenz(a,h)anthracene	53-70-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Benzo(g,h,i)perylene	191-24-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Fluorene	86-73-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	3-Nitroaniline	99-09-2	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	bis(2-Ethylhexyl)phthalate	117-81-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2-Methylphenol	95-48-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Chloroaniline	106-47-8	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Naphthalene	91-20-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,4-Dichlorophenol	120-83-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	bis(2-Chloroethoxy)methane	111-91-1	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2-Nitrophenol	88-75-5	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Nitrobenzene	98-95-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Hexachlorobutadiene	87-68-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2-Chlorophenol	95-57-8	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,4-Dimethylphenol	105-67-9	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	bis(2-Chloroisopropyl)ether	108-60-1	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Acetophenone	98-86-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Hexachloroethane	67-72-1	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	n-Nitroso-di-n-propylamine	621-64-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Methylphenol	106-44-5	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Diethylphthalate	84-66-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,4-Dinitrophenol	51-28-5	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	bis(2-Chloroethyl)ether	111-44-4	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	DIMETHYL PHTHALATE	131-11-3	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Dibenzofuran	132-64-9	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Nitrophenol	100-02-7	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Benzaldehyde	100-52-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Acenaphthene	83-32-9	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Isophorone	78-59-1	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,4-Dinitrotoluene	121-14-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Caprolactam	105-60-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Phenol	108-95-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,6-Dinitrotoluene	606-20-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2-Nitroaniline	88-74-4	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2-Chloronaphthalene	91-58-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	1,1-Biphenyl	92-52-4	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,4,5-Trichlorophenol	95-95-4	990	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2,4,6-Trichlorophenol	88-06-2	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Hexachlorocyclopentadiene	77-47-4	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	2-Methylnaphthalene	91-57-6	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	4-Chloro-3-methylphenol	59-50-7	390	UG_KG	U	R	SSL
SVOA	CAA06-SS17-1108	Acenaphthylene	208-96-8	390	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Dibenzofuran	132-64-9	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	n-Nitrosodiphenylamine	86-30-6	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Pentachlorophenol	87-86-5	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Phenanthrene	85-01-8	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Atrazine	1912-24-9	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Bromophenyl-phenylether	101-55-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4,6-Dinitro-2-methylphenol	534-52-1	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Nitroaniline	100-01-6	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Chlorophenyl-phenylether	7005-72-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Fluorene	86-73-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,4-Dinitrotoluene	121-14-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Anthracene	120-12-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Benzo(g,h,i)perylene	191-24-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Diethylphthalate	84-66-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Chrysene	218-01-9	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Hexachlorobenzene	118-74-1	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Dibenz(a,h)anthracene	53-70-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Nitrophenol	100-02-7	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Benzo(a)pyrene	50-32-8	360	UG_KG	U	R	SSL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
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Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
SVOA	CAA06-SS18-1108	Benzo(k)fluoranthene	207-08-9	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Benzo(b)fluoranthene	205-99-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Indeno(1,2,3-cd)pyrene	193-39-5	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	bis(2-Ethylhexyl)phthalate	117-81-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Carbazole	86-74-8	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Benzo(a)anthracene	56-55-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	3,3'-Dichlorobenzidine	91-94-1	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Butylbenzylphthalate	85-68-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Pyrene	129-00-0	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Fluoranthene	206-44-0	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Di-n-butylphthalate	84-74-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Di-n-octylphthalate	117-84-0	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Chloroaniline	106-47-8	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Nitrobenzene	98-95-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Methylphenol	106-44-5	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Hexachloroethane	67-72-1	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,4,6-Trichlorophenol	88-06-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Hexachlorocyclopentadiene	77-47-4	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2-Methylnaphthalene	91-57-6	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	4-Chloro-3-methylphenol	59-50-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	bis(2-Chloroisopropyl)ether	108-60-1	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Hexachlorobutadiene	87-68-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Acetophenone	98-86-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Naphthalene	91-20-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,4-Dichlorophenol	120-83-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	bis(2-Chloroethoxy)methane	111-91-1	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,4-Dimethylphenol	105-67-9	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2-Nitrophenol	88-75-5	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Isophorone	78-59-1	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,4-Dinitrophenol	51-28-5	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Caprolactam	105-60-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,4,5-Trichlorophenol	95-95-4	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Acenaphthene	83-32-9	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	3-Nitroaniline	99-09-2	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Acenaphthylene	208-96-8	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2,6-Dinitrotoluene	606-20-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	DIMETHYL PHTHALATE	131-11-3	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2-Nitroaniline	88-74-4	910	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	n-Nitroso-di-n-propylamine	621-64-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	1,1-Biphenyl	92-52-4	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2-Methylphenol	95-48-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Benzaldehyde	100-52-7	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	Phenol	108-95-2	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	bis(2-Chloroethyl)ether	111-44-4	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2-Chlorophenol	95-57-8	360	UG_KG	U	R	SSL
SVOA	CAA06-SS18-1108	2-Chloronaphthalene	91-58-7	360	UG_KG	U	R	SSL
AVSSEM	CAA06-SSD01-1008	MERCURY, SEM	7439-97-6	0.000041	MG_KG	UN	R	MSL
AVSSEM	CAA06-SSD02-1008	MERCURY, SEM	7439-97-6	0.0000365	MG_KG	UN	R	MSL
EXPLO	CAA06-SSD02-1008	Nitroglycerin	55-63-0	2.5	MG_KG	U	R	SSL
SVOA	CAA06-SSD02-1008	4-Nitroaniline	100-01-6	1500	UG_KG	U	R	CCL
FMETAL	CAA07-DW01-1008	Thallium	7440-28-0	2.4	UG_L	B	B	BL
FMETAL	CAA07-DW01-1008	Cobalt	7440-48-4	0.44	UG_L	B	B	BL
FMETAL	CAA07-DW01-1008	Lead	7439-92-1	2	UG_L	B	B	BL
FMETAL	CAA07-DW01-1008	Cadmium	7440-43-9	0.09	UG_L	B	B	BL
METAL	CAA07-DW01-1008	Thallium	7440-28-0	4.2	UG_L	B	B	BL
FMETAL	CAA07-DW02-1008	Arsenic	7440-38-2	7.5	UG_L	B	B	BL
FMETAL	CAA07-DW02-1008	Cadmium	7440-43-9	0.23	UG_L	B	B	BL
FMETAL	CAA07-DW02-1008	Lead	7439-92-1	3.4	UG_L	B	B	BL
FMETAL	CAA07-DW02-1008	Thallium	7440-28-0	2.7	UG_L	B	B	BL
METAL	CAA07-DW02-1008	Arsenic	7440-38-2	7.3	UG_L	B	B	BL
METAL	CAA07-DW02-1008	Cadmium	7440-43-9	0.21	UG_L	B	B	BL

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Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
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Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
METAL	CAA07-DW02-1008	Lead	7439-92-1	3.6	UG_L	B	B	BL
METAL	CAA07-DW02-1008	Thallium	7440-28-0	2.5	UG_L	B	B	BL
FMETAL	CAA07-DW03-1008	Arsenic	7440-38-2	3.7	UG_L	B	B	BL
FMETAL	CAA07-DW03-1008	Cobalt	7440-48-4	0.88	UG_L	B	B	BL
FMETAL	CAA07-DW03-1008	Cadmium	7440-43-9	0.4	UG_L	B	B	BL
FMETAL	CAA07-DW03-1008	Lead	7439-92-1	1.7	UG_L	B	B	BL
FMETAL	CAA07-DW03-1008	Thallium	7440-28-0	2.6	UG_L	B	B	BL
METAL	CAA07-DW03-1008	Thallium	7440-28-0	2.8	UG_L	B	B	BL
METAL	CAA07-DW03-1008	Lead	7439-92-1	4.6	UG_L	B	B	BL
FMETAL	CAA07-DW03P-1008	Thallium	7440-28-0	2.5	UG_L	B	B	BL
FMETAL	CAA07-DW03P-1008	Arsenic	7440-38-2	4.3	UG_L	B	B	BL
FMETAL	CAA07-DW03P-1008	Lead	7439-92-1	2.1	UG_L	B	B	BL
FMETAL	CAA07-DW03P-1008	Cadmium	7440-43-9	0.34	UG_L	B	B	BL
FMETAL	CAA07-DW03P-1008	Cobalt	7440-48-4	0.73	UG_L	B	B	BL
METAL	CAA07-DW03P-1008	Arsenic	7440-38-2	6.1	UG_L	B	B	BL
METAL	CAA07-DW03P-1008	Cobalt	7440-48-4	1	UG_L	B	B	BL
METAL	CAA07-DW03P-1008	Lead	7439-92-1	1.9	UG_L	B	B	BL
METAL	CAA07-DW03P-1008	Thallium	7440-28-0	2.2	UG_L	B	B	BL
FMETAL	CAA07-DW04-1008	Cadmium	7440-43-9	0.39	UG_L	B	B	BL
FMETAL	CAA07-DW04-1008	Arsenic	7440-38-2	3.5	UG_L	B	B	BL
FMETAL	CAA07-DW04-1008	Lead	7439-92-1	2.6	UG_L	B	B	BL
FMETAL	CAA07-DW04-1008	Cobalt	7440-48-4	0.74	UG_L	B	B	BL
FMETAL	CAA07-DW04-1008	Thallium	7440-28-0	3.2	UG_L	B	B	BL
METAL	CAA07-DW04-1008	Lead	7439-92-1	1.1	UG_L	B	B	BL
METAL	CAA07-DW04-1008	Thallium	7440-28-0	2	UG_L	B	B	BL
METAL	CAA07-DW04-1008	Cadmium	7440-43-9	0.34	UG_L	B	B	BL
METAL	CAA07-DW04-1008	Arsenic	7440-38-2	4	UG_L	B	B	BL
SVOA	CAA07-SB01-1008	4-Nitrophenol	100-02-7	920	UG_KG	U	R	CCL
VOA	CAA07-SB01-1008	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
VOA	CAA07-SB01-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL
METAL	CAA07-SB02-1008	Thallium	7440-28-0	0.11	MG_KG	B	B	BL
SVOA	CAA07-SB02-1008	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA07-SB02-1008	1,2-Dibromo-3-chloropropane	96-12-8	12	UG_KG	U	R	CCL
VOA	CAA07-SB02-1008	Acetone	67-64-1	12	UG_KG	JB	B	BL
VOA	CAA07-SB02-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
SVOA	CAA07-SB03-1008	4-Nitrophenol	100-02-7	890	UG_KG	U	R	CCL
VOA	CAA07-SB03-1008	1,2-Dibromo-3-chloropropane	96-12-8	10	UG_KG	U	R	CCL
VOA	CAA07-SB03-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL
VOA	CAA07-SB03-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
SVOA	CAA07-SB03P-1008	4-Nitrophenol	100-02-7	900	UG_KG	U	R	CCL
VOA	CAA07-SB03P-1008	Acetone	67-64-1	2	UG_KG	JB	B	BL
VOA	CAA07-SB03P-1008	Methylene chloride	75-09-2	9	UG_KG	JB	B	BL
VOA	CAA07-SB04-1008	Acetone	67-64-1	3	UG_KG	JB	B	BL
VOA	CAA07-SB04-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
VOA	CAA07-SB05-1008	Acetone	67-64-1	5	UG_KG	JB	B	BL
METAL	CAA07-SB06-1008	Sodium	7440-23-5	12.5	MG_KG	B	B	BL
VOA	CAA07-SB06-1008	Methylene chloride	75-09-2	8	UG_KG	JB	B	BL
METAL	CAA07-SB07-1008	Sodium	7440-23-5	15	MG_KG	B	B	BL
VOA	CAA07-SB07-1008	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA07-SBTP04-1008	Copper	7440-50-8	1.7	MG_KG	J	B	BL
VOA	CAA07-SBTP04-1008	Acetone	67-64-1	3	UG_KG	JB	B	BL
METAL	CAA07-SBTP05-1008	Sodium	7440-23-5	8.1	MG_KG	B	B	BL
VOA	CAA07-SBTP05-1008	Acetone	67-64-1	6	UG_KG	JB	B	BL
VOA	CAA07-SBTP05-1008	Methylene chloride	75-09-2	10	UG_KG	B	B	BL
METAL	CAA07-SBTP06-1008	Sodium	7440-23-5	7.2	MG_KG	B	B	BL
VOA	CAA07-SBTP06-1008	1,2-Dibromo-3-chloropropane	96-12-8	10	UG_KG	U	R	CCL
VOA	CAA07-SBTP06-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL
VOA	CAA07-SBTP06-1008	Methylene chloride	75-09-2	1	UG_KG	JB	B	BL
SVOA	CAA07-SS01-1008	4-Nitrophenol	100-02-7	980	UG_KG	U	R	CCL
VOA	CAA07-SS01-1008	Methylene chloride	75-09-2	7	UG_KG	JB	B	BL
VOA	CAA07-SS01-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL

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CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
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Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
SVOA	CAA07-SS02-1008	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
VOA	CAA07-SS02-1008	Methylene chloride	75-09-2	11	UG_KG	JB	B	BL
VOA	CAA07-SS02-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL
SVOA	CAA07-SS03-1008	4-Nitrophenol	100-02-7	940	UG_KG	U	R	CCL
VOA	CAA07-SS03-1008	Methylene chloride	75-09-2	8	UG_KG	JB	B	BL
VOA	CAA07-SS03-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL
SVOA	CAA07-SS03P-1008	4-Nitrophenol	100-02-7	930	UG_KG	U	R	CCL
VOA	CAA07-SS03P-1008	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
METAL	CAA07-SS04-1008	Cadmium	7440-43-9	0.01	MG_KG	B	B	BL
METAL	CAA07-SS04-1008	Sodium	7440-23-5	12.6	MG_KG	B	B	BL
VOA	CAA07-SS04-1008	Methylene chloride	75-09-2	1	UG_KG	JB	B	BL
VOA	CAA07-SS05-1008	Methylene chloride	75-09-2	1	UG_KG	JB	B	BL
VOA	CAA07-SS05-1008	Acetone	67-64-1	4	UG_KG	JB	B	BL
METAL	CAA07-SS06-1008	Sodium	7440-23-5	11.9	MG_KG	B	B	BL
SVOA	CAA07-SS06-1008	4-Nitrophenol	100-02-7	920	UG_KG	U	R	CCL
VOA	CAA07-SS06-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA07-SS07-1008	Cadmium	7440-43-9	0.03	MG_KG	B	B	BL
METAL	CAA07-SS07-1008	Sodium	7440-23-5	13.4	MG_KG	B	B	BL
SVOA	CAA07-SS07-1008	4-Nitrophenol	100-02-7	960	UG_KG	U	R	CCL
VOA	CAA07-SS07-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
VOA	CAA07-SS07-1008	Acetone	67-64-1	3	UG_KG	JB	B	BL
METAL	CAA08-SB01-1008	Antimony	7440-36-0	3.9	MG_KG	UN	R	MSL
VOA	CAA08-SB01-1008	Acetone	67-64-1	28	UG_KG	B	B	BL
VOA	CAA08-SB01-1008	Methylene chloride	75-09-2	36	UG_KG	B	B	BL
METAL	CAA08-SB02-1008	Antimony	7440-36-0	4.1	MG_KG	UN	R	MSL
VOA	CAA08-SB02-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA08-SB03-1008	Antimony	7440-36-0	6.9	MG_KG	UN	R	MSL
VOA	CAA08-SB03-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA08-SB04-1008	Acetone	67-64-1	4	UG_KG	J	B	BL
VOA	CAA08-SB04-1008	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA08-SB05-1008	Antimony	7440-36-0	4.2	MG_KG	UN	R	MSL
VOA	CAA08-SB05-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA08-SB06-1008	Antimony	7440-36-0	5.5	MG_KG	UN	R	MSL
VOA	CAA08-SB06-1008	Acetone	67-64-1	13	UG_KG	CLEAR	B	BL
VOA	CAA08-SB06-1008	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA08-SB06P-1008	Antimony	7440-36-0	5.1	MG_KG	UN	R	MSL
VOA	CAA08-SB06P-1008	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
VOA	CAA08-SB06P-1008	Acetone	67-64-1	4	UG_KG	J	B	BL
SVOA	CAA08-SB07-1008	3-Nitroaniline	99-09-2	960	UG_KG	U	R	CCL
SVOA	CAA08-SB07-1008	4-Nitrophenol	100-02-7	960	UG_KG	U	R	CCL
VOA	CAA08-SB07-1008	Acetone	67-64-1	4	UG_KG	J	B	BL
VOA	CAA08-SB07-1008	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA08-SB08-1008	Antimony	7440-36-0	5.5	MG_KG	UN	R	MSL
METAL	CAA08-SB08-1008	Cadmium	7440-43-9	0.06	MG_KG	J	B	BL
SVOA	CAA08-SB08-1008	3-Nitroaniline	99-09-2	920	UG_KG	U	R	CCL
SVOA	CAA08-SB08-1008	4-Nitrophenol	100-02-7	920	UG_KG	U	R	CCL
VOA	CAA08-SB08-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
SVOA	CAA08-SB09-1008	4-Nitrophenol	100-02-7	880	UG_KG	U	R	CCL
SVOA	CAA08-SB09-1008	3-Nitroaniline	99-09-2	880	UG_KG	U	R	CCL
VOA	CAA08-SB09-1008	Acetone	67-64-1	3	UG_KG	J	B	BL
VOA	CAA08-SB09-1008	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
SVOA	CAA08-SB09P-1008	4-Nitrophenol	100-02-7	870	UG_KG	U	R	CCL
SVOA	CAA08-SB09P-1008	3-Nitroaniline	99-09-2	870	UG_KG	U	R	CCL
VOA	CAA08-SB09P-1008	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
VOA	CAA08-SB09P-1008	Acetone	67-64-1	3	UG_KG	J	B	BL
METAL	CAA08-SBTP14-1008	Antimony	7440-36-0	4.5	MG_KG	UN	R	MSL
METAL	CAA08-SBTP14-1008	Cadmium	7440-43-9	0.02	MG_KG	J	B	BL
VOA	CAA08-SBTP14-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
METAL	CAA08-SBTP19-1008	Antimony	7440-36-0	4.8	MG_KG	UN	R	MSL
VOA	CAA08-SBTP19-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
VOA	CAA08-SBTP19-1008	Acetone	67-64-1	13	UG_KG	B	B	BL

TABLE E-2

Data Summary Table: R- and B-Qualified Data
CAX AOCs 1, 2, 6, 7, and 8 Site Investigation
WPNSTA Cheatham Annex
Williamsburg, Virginia

Analysis Group	Sample ID	Analyte Name	CAS Number	Analytical Value	Units	Lab Qualifier	DV Qualifier	DV Qualification Code
SVOA	CAA08-SBTP24-1008	4-Nitrophenol	100-02-7	1000	UG_KG	U	R	CCL
SVOA	CAA08-SBTP24-1008	3-Nitroaniline	99-09-2	1000	UG_KG	U	R	CCL
VOA	CAA08-SBTP24-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
METAL	CAA08-SS01-1008	Antimony	7440-36-0	5.2	MG_KG	UN	R	MSL
VOA	CAA08-SS01-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA08-SS01-1008	Acetone	67-64-1	3	UG_KG	JB	B	BL
METAL	CAA08-SS02-1008	Antimony	7440-36-0	5.4	MG_KG	UN	R	MSL
VOA	CAA08-SS02-1008	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA08-SS03-1008	Antimony	7440-36-0	5.4	MG_KG	UN	R	MSL
VOA	CAA08-SS03-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
VOA	CAA08-SS04-1008	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL
METAL	CAA08-SS05-1008	Antimony	7440-36-0	5.5	MG_KG	UN	R	MSL
VOA	CAA08-SS05-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
METAL	CAA08-SS06-1008	Antimony	7440-36-0	5.1	MG_KG	UN	R	MSL
VOA	CAA08-SS06-1008	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
VOA	CAA08-SS06-1008	Acetone	67-64-1	3	UG_KG	J	B	BL
METAL	CAA08-SS06P-1008	Antimony	7440-36-0	4.9	MG_KG	UN	R	MSL
VOA	CAA08-SS06P-1008	Methylene chloride	75-09-2	5	UG_KG	JB	B	BL
METAL	CAA08-SS07-1008	Antimony	7440-36-0	6.4	MG_KG	UN	R	MSL
VOA	CAA08-SS07-1008	Methylene chloride	75-09-2	2	UG_KG	JB	B	BL
SVOA	CAA08-SS08-1008	3-Nitroaniline	99-09-2	960	UG_KG	U	R	CCL
SVOA	CAA08-SS08-1008	4-Nitrophenol	100-02-7	960	UG_KG	U	R	CCL
VOA	CAA08-SS08-1008	Acetone	67-64-1	3	UG_KG	J	B	BL
VOA	CAA08-SS08-1008	Methylene chloride	75-09-2	6	UG_KG	JB	B	BL
METAL	CAA08-SS09-1008	Cadmium	7440-43-9	0.03	MG_KG	B	B	BL
SVOA	CAA08-SS09-1008	4-Nitrophenol	100-02-7	900	UG_KG	U	R	CCL
SVOA	CAA08-SS09-1008	3-Nitroaniline	99-09-2	900	UG_KG	U	R	CCL
VOA	CAA08-SS09-1008	Acetone	67-64-1	3	UG_KG	J	B	BL
VOA	CAA08-SS09-1008	Methylene chloride	75-09-2	3	UG_KG	JB	B	BL
SVOA	CAA08-SS09P-1008	3-Nitroaniline	99-09-2	900	UG_KG	U	R	CCL
SVOA	CAA08-SS09P-1008	4-Nitrophenol	100-02-7	900	UG_KG	U	R	CCL
VOA	CAA08-SS09P-1008	Acetone	67-64-1	3	UG_KG	J	B	BL
VOA	CAA08-SS09P-1008	Methylene chloride	75-09-2	4	UG_KG	JB	B	BL

Appendix F
Historical Aerial Photographs

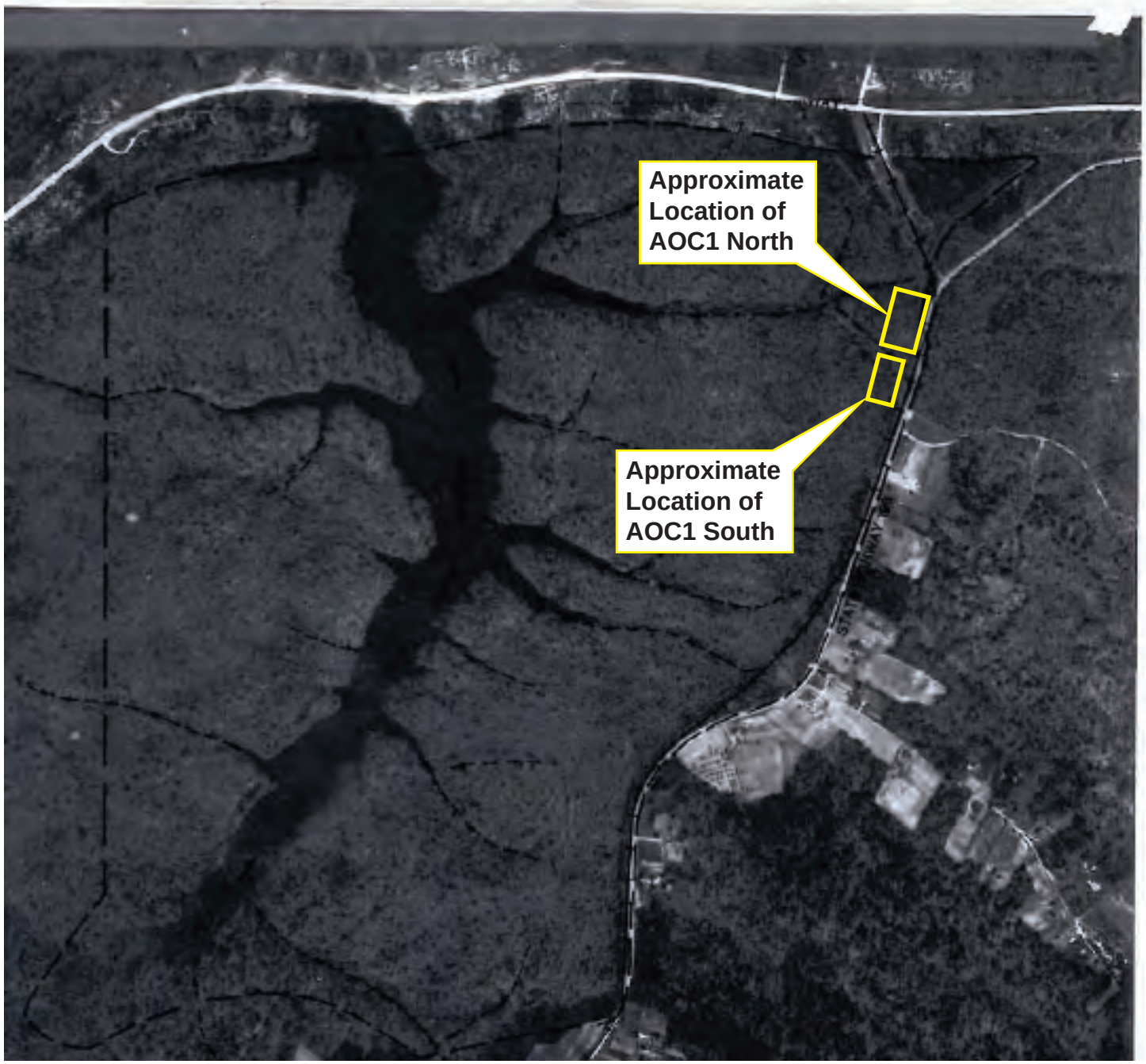

FIGURE F-1

INTERPRETATION CODE

BOUNDARIES AND LIMITS

FENCED SITE BOUNDARY

UNFENCED SITE BOUNDARY

FENCE

STUDY AREA

DRAINAGE

DRAINAGE

FLOW DIRECTION

INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

VEHICLE ACCESS

RAILWAY

SITE FEATURES

DIKE

STANDING LIQUID

SL STANDING LIQUID

EXCAVATION, PIT (EXTENSIVE)

MOUNDED MATERIAL (EXTENSIVE)

MM MOUNDED MATERIAL (SMALL)

CR CRATES/BOXES

DR DRUMS

HT HORIZONTAL TANK

PT PRESSURE TANK

VT VERTICAL TANK

CA CLEARED AREA

DG DISTURBED GROUND

FL FILL

IM IMPOUNDMENT

LG LAGOON

FIGURE F-2

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON

FIGURE F-3

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- XXXXXX FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON

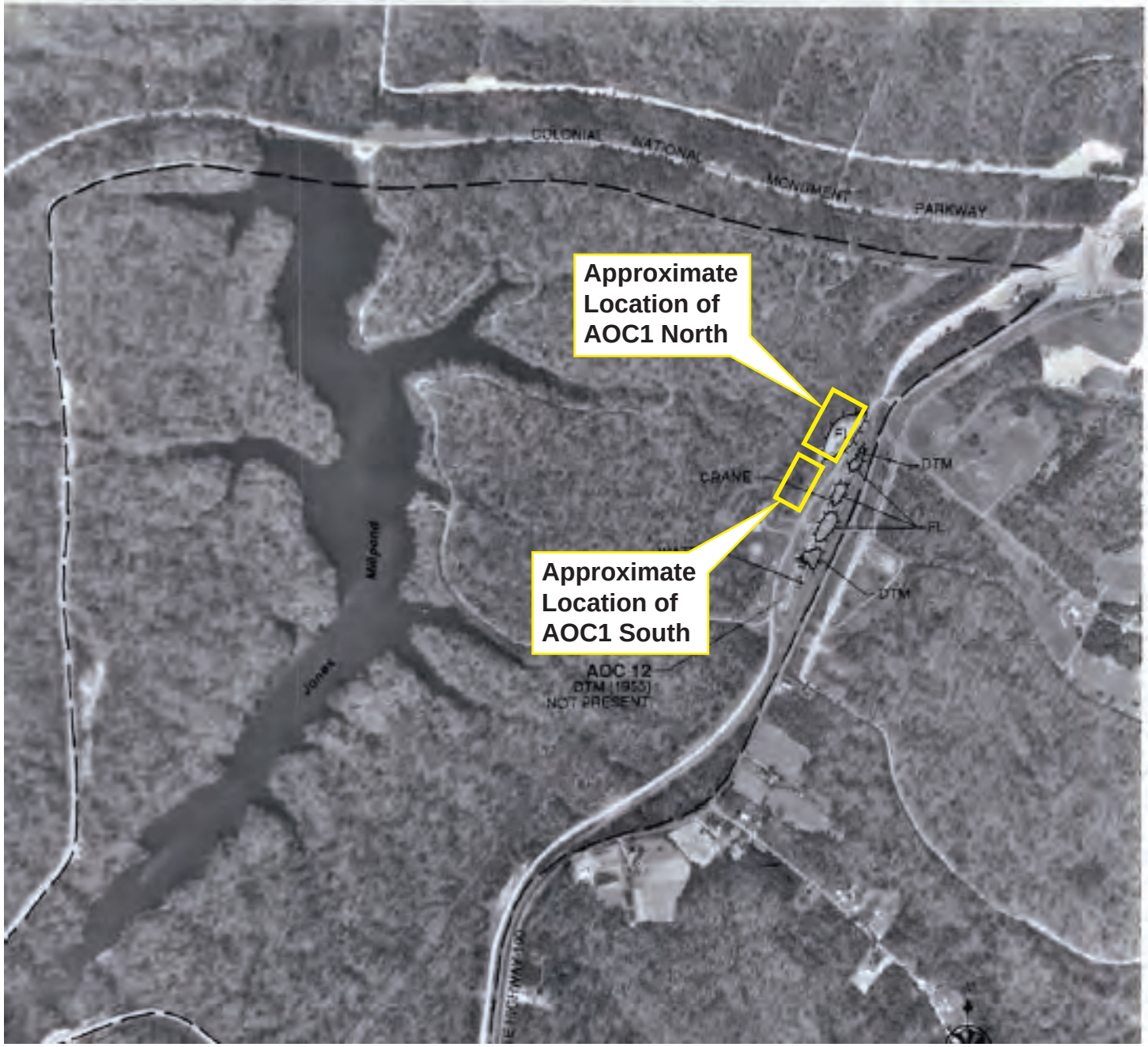

FIGURE F-4

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- XXXXXX FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON

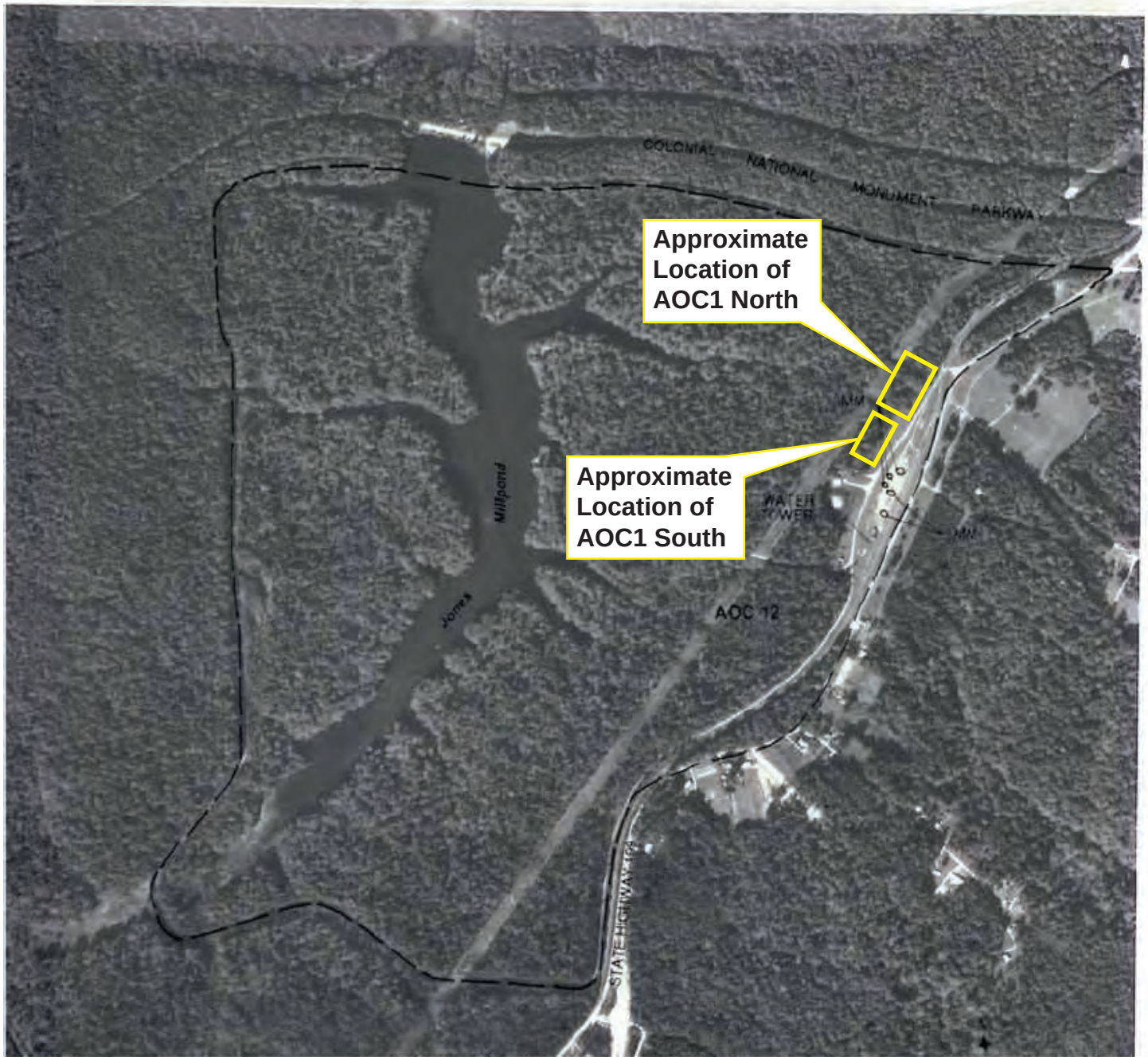

FIGURE F-5

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- x—x—x— FENCED SITE BOUNDARY
- ——— UNFENCED SITE BOUNDARY
- x x x x x x FENCE
- — — — STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON

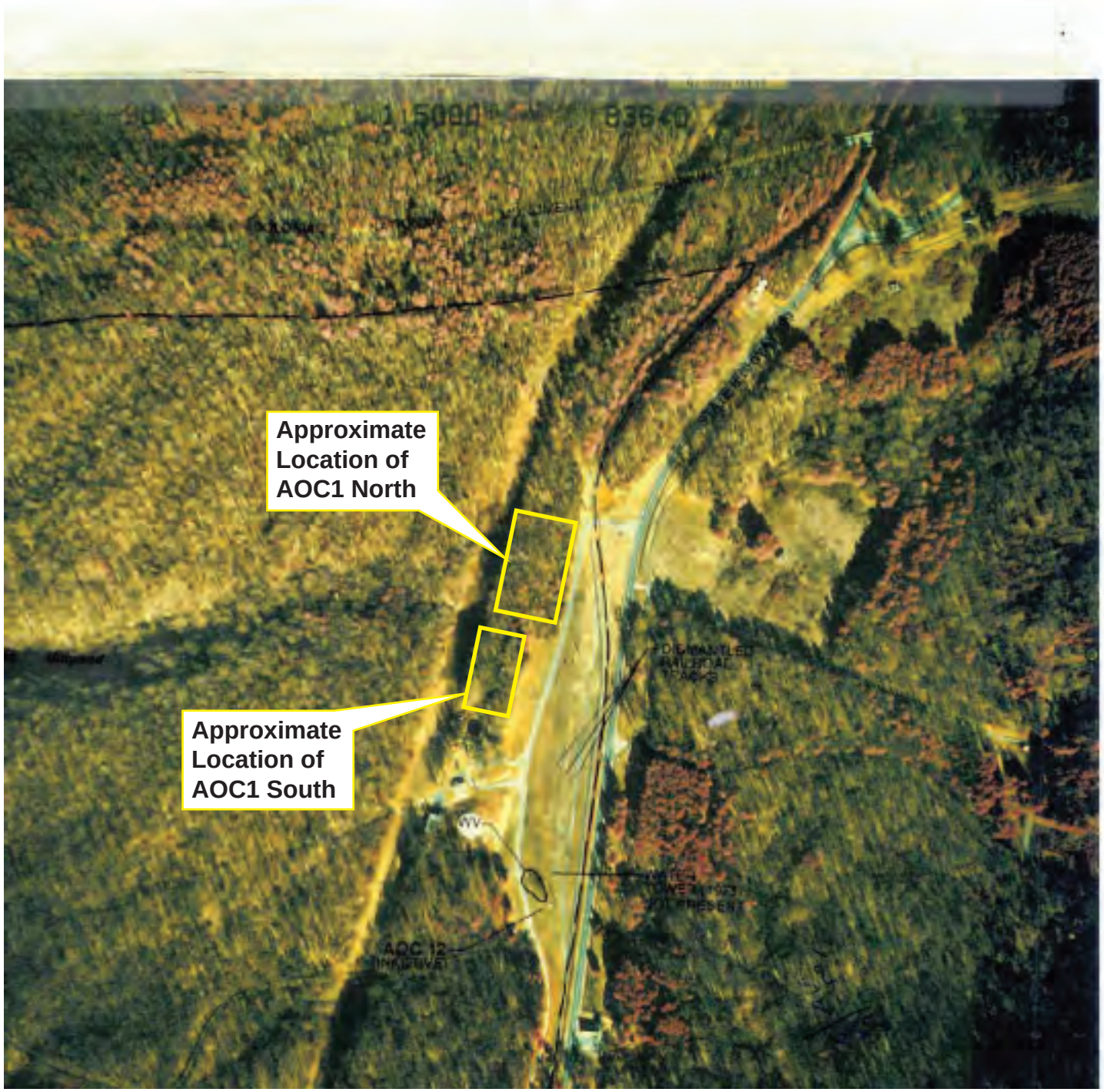

FIGURE F-6

INTERPRETATION CODE

BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL

Appendix G
Historical Analytical Data

TABLE G-1
AOC 1 - 1999 Surface Soil Sampling Results
Cheatham Annex
Williamsburg, Virginia

Station ID	**Residential RSLs-Soil**	A1-HA01	A1-HA02	A1-HA-03	A1-HA04	A1-HA05	A1-HA05	A1-HA06
Sample ID		A1-HA01-00[2]	A1-HA02-00[2]	A1-HA03-00[2]	A1-HA04-00[2]	A1-HA05-00[2]	A1-HA05-00D[1,2]	A1-HA06-00[2]
Sample Date		11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/14/99
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1-Dichloroethene	250,000.00	20.07 U	15.22 UL	18.18 U	15.64 U	16.87 U	**4 J**	14.15 UL
2-Butanone	28,000,000.00	20.07 U	15.22 UL	18.18 U	15.64 U	4 B	3 B	**5**
Benzene	1,100.00	20.07 U	15.22 UL	18.18 U	15.64 U	16.87 U	**4 J**	14.15 UL
Chlorobenzene	310,000.00	20.07 UL	15.22 UL	18.18 U	15.64 U	16.87 U	**5 J**	14.15 UL
Toluene	5,000,000.00	20.07 UL	15.22 UL	18.18 U	15.64 U	16.87 U	**5 J**	14.15 UL
Trichloroethene	2,800.00	20.07 U	15.22 UL	18.18 U	15.64 U	16.87 U	**4 J**	14.15 UL
Semi-volatile Organic Compounds (UG/KG)								
Benzo(a)Anthracene	150.00	**280**	**65 J**	600 U	490 U	580 U	610 U	450 U
Benzo(a)Pyrene	15.00	**870**	**92 J**	600 U	490 U	580 U	610 U	450 U
Benzo(b)Fluoranthene	150.00	**1700**	**110 J**	600 U	490 U	**66 J**	**87 J**	450 U
Benzo(g,h,i)Perylene	1,500.00	**970**	**78 J**	600 U	490 U	580 U	610 U	450 U
Benzo(k)Fluoanthene	1,500.00	**970**	**96 J**	600 U	490 U	580 U	610 U	450 U
Bis(2-Ethylhexyl)Phthalate	35,000.00	620 UL	450 U	**1800**	**12000 J**	**69 J**	**88 J**	**47 J**
Chrysene	15,000.00	**830**	**92 J**	600 U	490 U	**67 J**	**73 J**	450 U
Dibenz(a,h)Anthracene	15.00	**350**	450 U	600 U	490 U	580 U	610 U	450 U
Di-n-Butyl phthalate	6,100,000.00	620 UL	**72 J**	**130 J**	**100 J**	**78 J**	**170 J**	**110 J**
Fluoranthene	2,300,000.00	**250**	**150 J**	600 U	490 U	**61 J**	610 U	450 U
Indeno(1,2,3-cd)Pyrene	150.00	**810**	**74 J**	600 U	490 U	580 U	610 U	450 U
Phenanthrene	17,000,000.00	**78**	**71 J**	600 U	490 U	580 U	610 U	450 U
Phenol	18,000,000.00	620 UL	450 U	600 U	490 U	580 U	610 U	450 U
Pyrene	1,700,000.00	**360**	**100 J**	600 U	490 U	**65 J**	610 U	450 U
Pesticide/Polychlorinated Biphenyls (UG/KG)								
4,4'-DDE	1,400.00	**18**	4.5 U	6 U	**1.5 L**	5.7 UL	6.1 U	4.5 U
4,4'-DDT	1,700.00	**15**	4.5 U	6 U	**120**	5.7 UL	6.1 U	4.5 U
Aroclor-1260	220.00	62 UL	45 U	60 U	**220 L**	57 UL	61 U	45 U
alpha-Chlordane	1,600.00	**4.3**	2.3 U	3.1 U	2.5 UL	2.9 UL	3.1 U	2.3 U
Endosulfan Sulfate	370,000.00	**14**	4.5 U	6 U	4.8 UL	5.7 UL	6.1 U	4.5 U
Explosives (UG/KG)								
No detections								
Total Metals (MG/KG)								
Aluminum	77,000.00	**9030 L**	**5620 L**	**8410 L**	**8400 L**	**3570 L**	**5200 L**	**6020 L**
Antimony	31.00	2.5 B	1.3 B	1.4 B	13.9 U	**5.7 J**	**5.9 J**	0.53 U
Arsenic	0.39	**23.5**	2.3 U	**7.6**	**2.4**	**1.4 J**	**1.8 J**	**1.7 J**
Barium	15,000.00	**151**	**147**	**116**	**70.3**	**91.6**	**94.9**	**38.2 J**
Cadmium	70.00	**0.89 J**	2.3 U	1.4 U	1.2 U	1.5 U	1.3 U	**0.52 J**
Calcium	--	**17900**	**11900**	**35900**	**8770**	**10600**	**11100**	**4480**
Chromium	120,000.00	**44.7**	**12.3**	**13**	**10**	**10.3**	**10.9**	**7.2**
Cobalt	--	**5.3 J**	**4.4 J**	**9.9 J**	**3.1 J**	**4.8 J**	**4.1 J**	1.5 U
Copper	3,100.00	**17.4**	**13.1**	11.3 B	**19.4**	**88.5**	**65**	**3.2 J**
Cyanide	1,600.00	0.9 UL	**0.08 J**	0.9 UL	0.7 UL	**0.2 J**	**0.2 J**	0.03 UL
Iron	55,000.00	**17300 L**	**35200 L**	**11200 L**	**12200 L**	**34900 L**	**29900 L**	**8050**
Lead	400.00	**194**	**86.3**	**46.2**	**35.2**	**493**	**501**	**16.2**
Magnesium	--	**1980**	**913 J**	**1390 J**	**1350**	**724 J**	**861 J**	**380 J**
Manganese	1,800.00	**523**	**291**	**481**	**460**	**375**	**389**	**122**
Mercury	6.70	**0.13 J**	**0.05 J**	**0.08 J**	**0.08 J**	**0.05 J**	**0.05 J**	0.03 UL
Nickel	1,600.00	**8.7 J**	**7.7 J**	**7.2 J**	**5.1 J**	**7 J**	**8.8 J**	3.4 B
Potassium	--	**652 J**	**622 J**	**579 J**	385 B	308 B	383 B	250 B
Vanadium	390.00	**26**	**18.8**	**21.6**	**15.5**	**15.4**	**17.1**	**14.6**
Zinc	23,000.00	**849**	**110**	**132**	59 B	**292**	**250**	**293**

NOTES:
[1]Duplicate of sample A1-HA05-00
[2]Data as reported in the *Final Site Inspection Report, Site 4 and AOC 1, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Site*by Baker, May 10, 2001.
Detections of a chemical are indicated in bold font.
J = Estimated concentration below the quantitation limit
L = Analyte is present. The reported value may be biased low. The actual value is expected to be higher than reported.
B = Not detected substantially above the level reported in laboratory or field blanks.
UL = Not detected, quantitation limit is probably higher.
U = Not detected.

TABLE G-2
AOC 1 - 1999 Subsurface Soil Sampling Results
Cheatham Annex
Williamsburg, Virginia

Station ID	**Residential RSLs-Soil**	A1-HA02	A1-HA03	A1-HA04	A1-HA05-01	A1-HA05	A1-HA06
Sample ID		A1-HA02-02[2]	A1-HA03-02[2]	A1-HA04-02[2]	A1-HA05-01[2]	A1-HA05-01D[1,2]	A1-HA06-02[2]
Sample Date		11/12/99	11/12/99	11/12/99	11/14/99	11/14/99	11/14/99
Chemical Name							
Volatile Organic Compounds (UG/KG)							
Xylene (Total)	600,000.00	11.76 U	12.5 U	11.49 U	**2**	**3**	13.26 U
Semi-volatile Organic Compounds (UG/KG)							
Benzo(a)Anthracene	150.00	390 U	410 U	380 U	570 U	**64 J**	400 U
Benzo(a)Pyrene	15.00	390 U	410 U	380 U	570 U	**59 J**	400 U
Benzo(b)Fluoranthene	150.00	390 U	410 U	380 U	**79 J**	**88 J**	400 U
Benzo(g,h,i)Perylene	1,500.00	390 U	410 U	380 U	570 U	**71 J**	400 U
Benzo(k)Fluoanthene	1,500.00	390 U	410 U	380 U	**74 J**	**65 J**	400 U
Bis(2-Ethylhexyl)Phthalate	35,000.00	**76 J**	**54 J**	**46 J**	570 U	540 U	400 U
Butylbenzylphthalate	12,000,000.00	390 U	410 U	380 U	570 U	540 U	400 U
Chrysene	15,000.00	390 U	410 U	380 U	**83 J**	**81 J**	400 U
Di-n-Butylphthalate	6,100,000.00	**49 J**	**52 J**	**79 J**	110 J	**110 J**	**73 J**
Fluoranthene	2,300,000.00	390 U	410 U	380 U	100 J	**140 J**	400 U
Indeno(1,2,3-cd)Pyrene	150.00	390 U	410 U	380 U	570 U	**55 J**	400 U
Phenanthrene	17,000,000.00	390 U	410 U	380 U	570 U	**97 J**	400 U
Pyrene	1,700,000.00	390 U	410 U	380 U	**78 J**	**110 J**	400 U
Pesticide/Polychlorinated Biphenyls (UG/KG)							
No detections							
Explosives (UG/KG)							
No detections							
Total Metals (MG/KG)							
Aluminum	77,000.00	**4700 L**	**6240 L**	**5340 L**	**4410 L**	**4080 L**	**8830 L**
Antimony	31.00	**0.46 B**	0.6 B	10.9 U	**12 J**	**11.4 J**	**0.41 B**
Arsenic	0.39	**1.3 J**	**5.2**	**1.9**	**5.1**	**4.2**	**33.3**
Barium	15,000.00	**12.9 B**	**28.5 J**	**25.9 J**	**81.3**	**90.9**	**41.3**
Beryllium	160.00	**0.21 B**	1.1 B	0.5 B	**0.34 J**	**0.22 J**	**0.95**
Cadmium	70.00	0.9 U	1 U	**0.07 J**	0.08 U	0.08 U	0.06 U
Calcium	--	**1090**	**1960**	**1490**	**10200**	**10400**	**2920**
Chromium	120,000.00	**9.2**	**19.4**	**3.6**	**16.8**	**11.1**	**32.6**
Cobalt	--	**1.5 J**	**5.8 J**	**2.8 J**	**4.6 J**	**4.5 J**	**9.4**
Copper	3,100.00	**1.6 B**	2.1 B	1.5 B	**86**	**146**	3.5 B
Cyanide	1,600.00	**0.6 L**	0.6 U	0.6 U	**0.68 J**	**0.2 J**	**0.08 J**
Iron	55,000.00	**6590 L**	**19800 L**	**2630 L**	**30600**	**35300**	**39700**
Lead	400.00	**4.7**	**6.7**	**7.3**	**483**	**1120**	**7.7**
Magnesium	--	**1430**	**547 J**	81.4 B	**606 J**	**654 J**	**1040**
Manganese	1,800.00	**11**	**48.2**	**126**	**384**	**401**	**151**
Mercury	6.70	0.1 U	0.1 U	**0.02 J**	**0.06 L**	0.04 UL	0.03 UL
Nickel	1,600.00	**1.2 J**	**7.7 J**	**2.9 J**	**23.3 L**	13.6 B	12.3 B
Potassium	--	226 B	**690 J**	117 B	472 B	279 B	**1040**
Selenium	390.00	0.9 U	1 U	0.9 U	0.73 U	0.75 U	0.55 U
Silver	390.00	1.6 B	5.6 B	1.8 U	7.6 B	9.7 B	**11.3**
Vanadium	390.00	**19.5**	**20.2**	**6.9**	**16.7**	**14.4**	**40.8**
Zinc	23,000.00	4.2 B	25.7 B	5.6 B	**330**	**365**	35.3 B

NOTES:
[1]Duplicate of sample A1-HA05-01
[2]Data as reported in the *Final Site Inspection Report, Site 4 and AOC 1, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Site* by Baker, May 10, 2001.
Detections of a chemical are indicated in bold font.
J = Estimated concentration below the quantitation limit
L = Analyte is present. The reported value may be biased low. The actual value is expected to be higher than reported.
B = Not detected substantially above the level reported in laboratory or field blanks.
UL = Not detected, quantitation limit is probably higher.
U = Not detected.
Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

TABLE G-3
AOC 1 - 1999 Surface Water Sampling Results
Cheatham Annex
Williamsburg, Virginia

Station ID	**Residential RSLs-Soil**	A1-SW01	A1-SW02	A1-SW03	A1-SW03D
Sample ID		A1-SW01[2]	A1-SW02[2]	A1-SW03[2]	A1-SW03D[1,2]
Sample Date		11/14/99	11/14/99	11/14/99	11/14/99
Chemical Name					
Volatile Organic Compounds (UG/L)					
No detections					
Semivolatiles (UG/L)					
Bis(2-Ethylhexyl)Phthalate	35,000.00	10 U	**98**	**37 J**	**2 J**
Di-n-Octyl Phthalate	180,000.00	**3 J**	10 U	10 U	10 U
Pesticides/PCBs (UG/L)					
No detections					
Explosives (UG/L)					
No detections					
Inorganics (UG/L)					
Arsenic	0.39	3.4 U	3.4 U	**17.1**	**19**
Barium	15,000.00	55.6 B	33.8 B	**89.8 J**	**92 J**
Calcium	--	**129000**	**94900**	**134000**	**141000**
Iron	55,000.00	**339**	**520**	**25900**	**25700**
Magnesium	--	**2870 J**	**1780 J**	**4170 J**	**4390 J**
Manganese	1,800.00	**108**	**26.1**	**631**	**656**
Nickel	1,600.00	6 U	6 U	6 U	6 U
Potassium	--	**1710 J**	1340 B	**2360 J**	**2660 J**
Sodium	--	**6550 J**	**4570 J**	**6780 J**	**6970 J**

NOTES:
[1]Duplicate of sample A1-SW03
[2]Data as reported in the *Final Site Inspection Report, Site 4 and AOC 1, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Site* by Baker, May 10, 2001.
Detections of a chemical are indicated in bold font.
J = Estimated concentration below the quantitation limit
U = Not detected.
B = Not detected substantially above the level reported in laboratory or field blanks.
UL = Not detected, quantitation limit is probably higher.

TABLE G-4
AOC 1 - 1999 Sediment Sampling Results
Cheatham Annex
Williamsburg, Virginia

Station ID	Residential RSLs-Soil	Northern portion of the drainage channel receiving runoff from AOC 1 near Jones Mill Pond	A1-SD01	A1-SD01	A1-SD02	A1-SD02	A1-SD03	A1-SD03	A1-SD03	A1-SD04	A1-SD04
Sample ID		PEN1-SED-04[2]	A1-SD01-00[3]	A1-SD01-01[3]	A1-SD02-00[3]	A1-SD02-01[3]	A1-SD03-00[3]	A1-SD03-00D[1,3]	A1-SD03-01[3]	A1-SD04-00[3]	A1-SD04-01[3]
Sample Date		01/13/99	11/14/99	11/14/99	11/14/99	11/14/99	11/14/99	11/14/99	11/14/99	11/14/99	11/14/99
Chemical Name											
Volatile Organic Compounds (UG/KG)											
2-Butanone	28,000,000.00	0.013 U	**3 J**	**5 J**	**5 J**	**4 J**	17 B	5 B	65 B	13.25 U	13.77 U
Ethylbenzene	5,700.00	0.013 U	**2 J**	**2 J**	12.95 U	13.2 U	15.94 U	16.39 U	17.9 U	13.25 U	**2 J**
Xylene (Total)	600,000.00	0.013 U	**6 J**	5 B	12.95 U	**2 J**	15.94 U	16.39 U	17.9 U	13.25 U	**4 J**
Semi-volatile Organic Compounds (UG/KG)											
2-Methylnaphthalene	310,000.00	**0.1275 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Benzo(a)Anthracene	150.00	**0.0058 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Benzo(a)Pyrene	15.00	**0.0024 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Benzo(b)Fluoranthene	150.00	**0.0026 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Benzo(k)Fluoanthene	1,500.00	**0.0026 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Bis(2-Ethylhexyl)Phthalate	35,000.00	0.068 B	480 U	**48 J**	450 U	**46 J**	510 U	**63 J**	580 U	**46 J**	**51 J**
Chrysene	15,000.00	**0.0112 J**	480 U	460 U	450 U	430 U	510 U	540 U	**63 J**	450 U	440 U
Di-n-Butyl phthalate	6,100,000.00	0.44 U	**120 J**	**120 J**	**93 J**	**81 J**	**110 J**	**85 J**	**80 J**	**98 J**	**64 J**
Fluoranthene	2,300,000.00	**0.0035 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	**47 J**	440 U
Naphthalene	3,900.00	**0.00675 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Phenanthrene	17,000,000.00	**0.0025 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Pyrene	1,700,000.00	**0.0029 J**	480 U	460 U	450 U	430 U	510 U	540 U	580 U	450 U	440 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	2,000.00	**0.00023 J**	4.7 U	4.6 U	4.5 U	4.3 U	4.7 UL	5.4 U	5.8 U	4.4 U	4.4 U
4,4'-DDE	1,400.00	**0.000054 J**	4.7 U	4.6 U	4.5 U	4.3 U	4.7 UL	5.4 U	5.8 U	4.4 U	4.4 U
Aroclor-1260	220.00	0.044 U	47 U	46 U	45 U	43 U	47 UL	54 U	58 U	44 U	**14 J**
alpha-Chlordane	1,600.00	**0.0027 J**	2.4 U	2.4 U	2.3 U	2.2 U	2.4 UL	2.8 U	3 U	2.3 U	2.3 U
gamma-Chlordane	1,600.00	**0.0001 J**	2.4 U	2.4 U	2.3 U	2.2 U	2.4 UL	2.8 U	3 U	2.3 U	2.3 U
Endosulfan II	370,000.00	**0.000065 J**	4.7 U	4.6 U	4.5 U	4.3 U	4.7 UL	5.4 U	5.8 U	4.4 U	4.4 U
Endrin	1,800.00	**0.00006 J**	4.7 U	4.6 U	4.5 U	4.3 U	4.7 UL	5.4 U	5.8 U	4.4 U	4.4 U
Endrin Ketone	1,800.00	**0.0002 J**	4.7 U	4.6 U	4.5 U	4.3 U	4.7 UL	5.4 U	5.8 U	4.4 U	4.4 U
Methoxychlor	310,000.00	**0.00069 J**	24 U	24 U	23 U	22 U	24 UL	28 U	30 U	23 U	23 U
Explosives (UG/KG)											
No detections											
Total Metals (MG/KG)											
Aluminum	77,000.00	**5430**	**1790 L**	**2970 L**	**4230 L**	**2060 L**	**2480 L**	**3510 L**	**4170 L**	**6740 L**	**4600 L**
Antimony	31.00	UL	0.47 U	0.36 U	0.46 U	0.36 U	0.56 U	0.56 U	0.51 U	0.52 U	0.46 U
Arsenic	0.39	**10.8**	**1.5 J**	**1.4 J**	**1.6 J**	**1.1 J**	**7.1**	**10.5**	**7.4**	**2.1 J**	**1.8 J**
Barium	15,000.00	**54.7**	9.4 B	11.3 B	16.3 B	10.2 B	16 B	23.4 B	15.2 B	23.3 B	**18.1 J**
Beryllium	160.00	**0.36 J**	**0.22 J**	**0.23 J**	**0.29 J**	**0.22 J**	**0.18 J**	**0.22 J**	**0.16 J**	**0.16 U**	**0.26 J**
Cadmium	70.00	ND	0.07 U	0.06 U	0.07 U	0.05 U	0.09 U	0.09 U	0.08 U	0.08 U	0.07 U
Calcium	--	**15583.33333**	**1420**	**1250**	**1270**	**899 L**	**17900**	**19000**	**3630**	**1940 B**	**1760 J**
Chromium	120,000.00	**8.7**	**4.3**	**6.2**	**11.1**	**6.1**	**6.3**	**8.1**	**7.1**	**4.8**	**4.8**
Cobalt	--	**2**	**1.9 J**	1.9 **J**	**2.4 J**	**1.2 J**	**3.6 J**	**3.1 J**	**2.8 J**	1.5 U	1.3 U
Copper	3,100.00	**4.7**	1.2 U	0.89 U	2.6 B	0.87 U	3.4 B	4.4 B	2.9 B	26.9 B	**16 J**
Cyanide	1,600.00	**0.12**	0.03 UL	0.02 UL	0.03 UL	0.02 UL	0.03 UL	0.03 UL	0.03 UL	0.03 UL	0.03 UL
Iron	55,000.00	**15100 J**	**3490**	**3320**	**4690**	**3510**	**12600**	**18700**	**9230**	**4940**	**3730 L**
Lead	400.00	**11**	**3.8**	**3.6**	**4.8**	**3.1**	**12.6**	**12.6**	**11.4**	**10.3**	**7.5**
Magnesium	--	**1100**	76.9 B	177 B	**304 J**	154 B	266 B	**325 J**	211 B	299 B	**216 J**
Manganese	1,800.00	**168**	**10**	**9**	**12.9**	**6.5**	**215**	**309**	**38.6**	**257**	**160**
Mercury	6.70	ND	0.03 UL	0.03 UL	0.02 UL	0.02 UL	0.03 UL	0.04 UL	0.03 UL	**0.07 L**	**0.04 L**
Nickel	1,600.00	**3.4**	2.1 B	3.1 B	8.2 B	2.6 B	5.1 B	3.1 B	2.5 B	2.9 B	**2.1 J**
Potassium	--	**548**	106 B	194 B	374 B	223 B	134 B	253 B	163 B	266 B	**199 L**
Selenium	390.00	UL	0.65 U	0.49 U	0.63 U	0.48 U	0.8 J	0.77 U	0.7 U	0.71 U	0.63 U
Silver	390.00	**0.42 L**	0.89 B	0.69 B	1.4 B	1.1 B	3 B	5.2 B	3.2 B	1.6 B	1.5 B
Sodium	--	**93.5**	35.2 B	32.1 B	52.5 B	26.4 B	64.2 B	95.2 B	80.9 B	74.9 B	55.5 B
Thallium	5.10	UL	0.52 U	0.39 U	0.5 U	0.39 U	0.62 UJ	0.71 B	0.56 U	0.57 U	0.5 UL
Vanadium	390.00	**13.6**	**5.6 J**	**8.1 J**	**11.2**	**7.5 J**	9.9 B	**12.4 J**	**14.8**	**7.7 J**	**7.4 J**
Zinc	23,000.00	**59.6**	9.6 B	9.7 B	10.3 B	8.1 B	47.6 B	74.1 B	29.7 B	79.8 B	51 B

NOTES:
[1]Duplicate of sample A1-SD03-00
[2]Data as reported in the *Final Site Inspection Narrative Report, Penniman Shell Loading Plant, Williamsburg, Virginia* by Roy F. Weston, Inc., August 9, 1999.
[3]Data as reported in the *Final Site Inspection Report, Site 4 and AOC 1, Naval Weapons Station Yorktown, Yorktown, Virginia, Cheatham Site* by Baker, May 10, 2001.
Detections of a chemical are indicated in bold font.
J = Estimated concentration below the quantitation limit
L = Analyte is present. The reported value may be biased low. The actual value is expected to be higher than reported.
B = Not detected substantially above the level reported in laboratory or field blanks.
UL = Not detected, quantitation limit is probably higher.
U = Not detected.
ND = Not detected.

TABLE G-5
Analytical Summary of Organic Compounds Detected
Area of Concern 2 - Dextrose Dump - Surface Soil
Cheatham Annex
Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-HA01-00	A2-HA01-00D	A2-HA02-00	A2-DPB01-00	A2-DPB02-00	A2-DPB03-00	A2-DPB04-00
SAMPLE DATE	Residential RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998
DEPTH		0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
PESTICIDES/PCBs (ug/kg)								
4,4'-DDE	1,400	4.1 UJ	4.1 UJ	520 J	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ
4,4'-DDT	1,700	4.1 UJ	4.1 UJ	640 J	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ
Heptachlor epoxide	53.0	2 UJ	4 J	25 UJ	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ

TABLE G-6
Analytical Summary of Inorganic Constituents Detected
Area of Concern 2 - Dextrose Dump - Surface Soil
Cheatham Annex
Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-HA01-00	A2-HA01-00D	A2-HA02-00	A2-DPB01-00	A2-DPB02-00	A2-DPB03-00	A2-DPB04-00
SAMPLE DATE	Residential RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998
DEPTH		0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5	0.0 - 0.5
INORGANICS (mg/kg)								
Aluminum	77,000	6,020	7,300	6,170	1,890	5,710	8,500	5,650
Antimony	31.0	0.56 UL	0.74 L	0.72 UL	0.58 UL	0.68 UL	0.63 UL	0.55 UL
Arsenic	0.39	11.1	14	6.6	3	3.5	20	5.5
Barium	15,000	64.5	77.2	47.2 J	18.4 J	36.5 J	38.7 J	48.6
Beryllium	160	0.55 J	0.64 J	0.43 J	0.14 J	0.2 J	0.77 J	0.43 J
Calcium	--	3,190	2,670	3,070	989	1,720	2,700	2,840
Chromium	230 (1)	24.6	39	15.3	3.9	12.5	29.4	11.5
Cobalt	--	4.1 J	5.6 J	4.2 J	1.5 U	2.4 J	6.1 J	2.8 J
Copper	3,100	20.2	20.5	6.2	2.2 J	2.4 J	7.8	4
Iron	55,000	22,700	28,600	14,800	3,180	13,800	44,000	15,000
Lead	400 (2)	57.1	104	89.9	13.3	8	29.3	20
Magnesium	--	795	906	697	269	384	1050	553
Manganese	1,800	240	238	176	62.7	152	169	170
Mercury	23.00 (3)	0.11 B	0.13 B	0.96 J	1.8	1.4	1.2 J	1.3
Nickel	1,600	10.6	12.5	6.9 J	2.3 U	4 J	12.1	5.6 J
Potassium	--	708	871	710	204 J	455	1,320	547
Selenium	390.0	0.51 U	0.53 U	0.66 U	0.53 U	0.63 U	0.64 K	0.71 K
Sodium	--	133 J	127 J	158 J	106 J	138 J	130 J	134 J
Vanadium	390	24.8	30.2	18.7	6 J	25.4	42.3	20.5
Zinc	23,000	49.9	53.6	96.9	9.5	21.3	55.9	22.8

Notes:
(1) Screening value for chromium VI used.
(2) Action level for lead
(3) Screening values for mercuric chloride

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for tapwater (beta version, 5/27/08).

TABLE G-7

Analytical Summary of Organic Compounds Detected

Area of Concern 2 - Dextrose Dump - Subsurface Soil

Cheatham Annex

Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-HA01-02	A2-HA01-02D	A2-HA02-01	A2-DPB01-03	A2-DPB01-15	A2-DPB02-03	A2-DPB02-10	A2-DPB03-03	A2-DPB03-09	A2-DPB04-03	A2-DPB04-09
SAMPLE DATE	Residential RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-23-1998	10-23-1998
DEPTH		1.0 - 2.0	1.0 - 2.0	0.5 - 1.0	6.0 - 8.0	30.0 - 32.0	6.0 - 8.0	20.0 - 22.0	6.0 - 8.0	18.0 - 20.0	6.0 - 8.0	18.0 - 20.0
VOLATILES (ug/kg)												
Acetone	61,000,000	14 U	15 U	11 U	66	14 U	14 UL	13 U	11 U	13 U	11 U	13 U
PESTICIDES/PCBs (ug/kg)												
4,4'-DDE	1,400	4.6 UJ	4.9 UJ	120 J	4.8 UJ	4.6 UJ	4.7 UJ	4.4 UJ	3.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ
4,4'-DDT	1,700	4.6 UJ	4.9 UJ	51 J	4.8 UJ	4.6 UJ	4.7 UJ	4.4 UJ	3.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ

TABLE G-8

Analytical Summary of Inorganic Constituents Detected

Area of Concern 2 - Dextrose Dump - Subsurface Soil

Cheatham Annex

Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-HA01-02	A2-HA01-02D	A2-HA02-01	A2-DPB01-03	A2-DPB01-15	A2-DPB02-03	A2-DPB02-10	A2-DPB03-03
SAMPLE DATE	Residential RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-22-1998
DEPTH		1.0 - 2.0	1.0 - 2.0	0.5 - 1.0	6.0 - 8.0	30.0 - 32.0	6.0 - 8.0	20.0 - 22.0	6.0 - 8.0
INORGANICS (mg/kg)									
Aluminum	77,000	12,500	11,000	6,450	5,390	5,210	5,630	2,370	6,680
Antimony	31.0	1 L	0.96 L	0.5 UL	0.65 UL	0.71 L	1.3 L	0.62 L	0.55 L
Arsenic	0.39	30.8	31.1	4.9	7.6	9.2	24.7	10.6	17.4
Barium	15,000	33.5 J	32.5 J	35.3 J	9 J	38.3 J	22.4 J	19.2 J	15.3 J
Beryllium	160	0.96 J	0.85 J	0.36 J	0.48 J	0.46 J	0.7 J	0.31 J	0.7 J
Cadmium	70.0	0.34 J	0.3 J	0.06 B	0.05 U	0.33 J	0.29 J	0.29 J	0.11 B
Calcium	--	1,690	1,720	1,290	499	156,000	2,580	152,000	309
Chromium	230.0 (1)	43.2	40.7	12.4	20.4	19.2	22.2	12.2	21.6
Cobalt	--	7 J	6.5 J	3.7 J	1.7 U	5.5 J	10.1 J	2.3 J	5.3 J
Copper	3,100	4.2	3.7	4.7	1.8 J	6.2	2.5 J	3.1	1.6 J
Iron	55,000	42,000	38,400	14,700	9,590	18,500	29,400	13,800	24,100
Lead	400 (2)	11.3	9.8	18.9	8.5	6.1	6.4	2.8	5.2
Magnesium	--	1,510	1,220	462	432	2,620	566	2,220	1,320
Manganese	1,800	79.5	74.6	99.9	7.1	97	75.9	43.1	54
Mercury	23.00 (3)	0.08 B	0.89 J	1	1.2	0.61 U	0.63 J	0.08 B	0.56 J
Nickel	1,600	21.8	21.2	6.6 J	2.6 U	10.8	15.3	5 J	9.8
Potassium	--	1,900	1,320	474	594	2,080	386	2,080	1,450
Selenium	390.0	0.68 K	0.63 U	0.46 U	0.6 U	0.56 U	0.6 U	0.54 U	0.47 U
Sodium	--	136 J	155 J	109 J	132 J	1,460	141 J	974	106 J
Vanadium	390	39.8	34.9	18.6	54.4	14.6	26.2	8.2 J	19.9
Zinc	23,000	49.9	47.4	49.8	7.3	37	45.8	21.4	32.7

Notes:

(1) Screening value for chromium VI used.

(2) Action level for lead

(3) Screening values for mercuric chloride

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for tapwater (beta version, 5/27/08).

TABLE G-8

Analytical Summary of Inorganic Constituents Detected

Area of Concern 2 - Dextrose Dump - Subsurface Soil

Cheatham Annex

Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-DPB03-09	A2-DPB04-03	A2-DPB04-09
SAMPLE DATE	Residential RSLs	10-22-1998	10-23-1998	10-23-1998
DEPTH		18.0 - 20.0	6.0 - 8.0	18.0 - 20.0
INORGANICS (mg/kg)				
Aluminum	77,000	2,910	8,030	4,330
Antimony	31.0	0.66 L	0.5 UL	0.64 L
Arsenic	0.39	9.3	2.7	7.2
Barium	15,000	19.5 J	12.1 J	29.8 J
Beryllium	160	0.46 J	0.25 J	0.6 J
Cadmium	70.0	0.29 J	0.04 U	0.37 J
Calcium	--	229,000	1,010	67,000
Chromium	230.0 (1)	13.2	27.5	19.2
Cobalt	--	2.5 J	3.5 J	4.6 J
Copper	3,100	2.8	2 J	1 U
Iron	55,000	21,600	11,000	45,300
Lead	400 (2)	2.1	3.7	3.8
Magnesium	--	3,390	1,180	2,860
Manganese	1,800	46	12.6	134
Mercury	23.00 (3)	0.95 J	0.94 J	0.69 J
Nickel	1,600	4.8 J	4.5 J	6.5 J
Potassium	--	4,720	1,100	4,520
Selenium	390.0	0.56 U	0.46 U	0.55 U
Sodium	--	1,240	102 J	252
Vanadium	390	9.4 J	32.7	14.8
Zinc	23,000	19	17.9	32.1

Notes:

(1) Screening value for chromium VI used.

(2) Action level for lead

(3) Screening values for mercuric chloride

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for tapwater (beta version, 5/27/08).

TABLE G-9

Analytical Summary of Organic Compounds Detected

Area of Concern 2 - Dextrose Dump - Groundwater

Cheatham Annex

Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-DPW01	A2-DPW02	A2-DPW03	A2-DPW03D	A2-DPW04
SAMPLE DATE	Tapwater RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-23-1998
SEMIVOLATILES (ug/L)						
Diethyl phthalate	29,000.0	1 J	10 U	10 U	10 U	10 U

TABLE G-10

Analytical Summary of Unfiltered Inorganic Constituents Detected

Area of Concern 2 - Dextrose Dump - Groundwater

Cheatham Annex

Williamsburg, Virginia

SAMPLE ID	Comparison to	A2-DPW01	A2-DPW02	A2-DPW03	A2-DPW03D	A2-DPW04
SAMPLE DATE	Tapwater RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-23-1998
UNFILTERED INORGANICS (ug/L)						
Aluminum	37,000	189,000	59,300	2,110	2,210	96,700
Antimony	15.0	13.8	7.7	2.4 U	2.4 U	11.3
Arsenic	0.045	181	89.9	3.7 J	5.1 J	430
Barium	7,300	510	195 J	36.5 J	38.3 J	275
Beryllium	73	9.6	3.3 J	0.2 U	0.2 U	5.7
Cadmium	18.0	8.7	5.9	4.3 U	4.3 U	6.5
Calcium	--	2,520,000	722,000	153,000	160,000	1,230,000
Chromium	110.0 (1)	595	229	9.6 J	10	364
Cobalt	--	73.7	32.2 J	6.3 U	6.3 U	45.6 J
Copper	1,500	99.5	37	4.1 U	4.1 U	45.9
Iron	26,000	380,000	133,000	5,550	5,630	262,000
Lead	400 (2)	94.6	36.1	1 U	1.2 B	53.7
Magnesium	--	51,900	17,900	2,270	2,340	31,800
Manganese	880	1,360	394	36.7	37.5	684
Nickel	730	170	70.7	9.6 U	9.6 U	109
Potassium	--	55,400	18,800	1,780 J	1,710 J	36,500
Selenium	180.0	2.2 U	4.6 K	2.2 U	2.9 K	2.2 U
Sodium	--	18,900	12,600	7,190	7,290	13,100
Thallium	2.4	1.2 L	2 J	1.2 U	1.2 U	1.2 U
Vanadium	260.0	417	205	6.1 J	4.8 J	309
Zinc	11,000	667	264	13.5 J	13.3 J	424

Notes: (1) Screening value for chromium VI used.
(2) Action level for lead

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for tapwater (beta version, 5/27/08).

TABLE G-11

Analytical Summary of Filtered Inorganicc Constituents Detected

Area of Concern 2 - Dextrose Dump - Groundwater

Cheatham Annex

Williamsburg,Virginia

SAMPLE ID	Comparison to	A2-DPW01F	A2-DPW02F	A2-DPW03F	A2-DPW03DF	A2-DPW04F
SAMPLE DATE	Tapwater RSLs	10-22-1998	10-22-1998	10-22-1998	10-22-1998	10-23-1998
FILTERED INORGANICS (ug/L)						
Aluminum	37,000	210	172 J	167 J	193 J	159 J
Arsenic	0.045	2.4 J	3.6 J	1.8 U	1.8 U	5.5 J
Barium	7,300	35.2 J	36.4 J	27.3 J	27 J	23.2 J
Calcium	--	158,000	143,000	132,000	132,000	133,000
Copper	1,500	4.1 U	4.2 J	4.1 U	4.5 J	6.5 J
Iron	26,000	56.6 J	53.2 J	92.7 J	86.2 J	208
Magnesium	--	2,240	3,730	1,600	1,620	1,710
Manganese	880	164	317	24.1	23.8	25
Potassium	--	1,000 J	2,060 J	869 J	861 J	1,060 J
Selenium	180.0	2.2 U	7.5 K	2.2 U	2.2 U	2.2 U
Sodium	--	6,980	9,840	7,040	6,910	6,080
Zinc	11,000	7.1 J	8 J	6.8 U	11.8 J	7.5 J

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for tapwater (beta version, 5/27/08).

TABLE G-12

Analytical Summary of Organic Compounds Detected in Soil

Area of Concern 2 - Dextrose Dump

Cheatham Annex

Williamsburg, Virginia

		Fill Zone									
		Test Pit							Stockpiled Soil [1]	[2]	TP06
Sample ID	**Comparison to**	**A2-TP01-F**	**A2-TP01-FD**	**A2-TP02-F**	**A2-TP03-F**	**A2-TP04-F**	**A2-TP05-F**	**A2-TP06-F**	**A2-CS01**	**A2-CS04**	**A2-TPCOMP-01**
Sample Date	**Residential RSLs**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**02/03/2000**	**02/04/2000**	**11/14/1999**
Volatiles (ug/kg)											
2-Butanone	28,000,000	14.1 U	4 B	11.9 U	5 B	11.8 U	12.2 UL	12.8 U	5 J	11 U	12.5 U
Benzene	1,100	14.1 U	12.2 U	11.9 U	11.5 U	11.8 U	12.2 UL	12.8 U	11 J	11 U	3 J
Ethylbenzene	5,700	14.1 U	12.2 U	11.9 U	11.5 U	11.8 U	10 J	12.8 U	11 U	11 U	12.5 U
Methylene Chloride	11,000	12 B	5 B	13 B	7 B	8 B	28 B	11 B	10 B	10 B	21 B
Styrene	6,500	14.1 U	12.2 U	11.9 U	11.5 U	11.8 U	12.2 UL	12.8 U	11 U	11 U	12.5 U
Xylene (Total)	600,000	14.1 U	12.2 U	11.9 U	11.5 U	11.8 U	12.2 UL	12.8 U	11 U	11 U	12.5 U
Semivolatiles (ug/kg)											
Benzo(b)Fluoranthene	150	800 U	420 U	390 U	400 U	400 U	390 U	420 U	380 U	42 J	NA
Bis(2-Ethylhexyl)Phthalate	35,000	800 U	56 J	44 J	2,500	660	150 J	420 U	63 J	370 U	NA
Chrysene	15,000	800 U	420 U	390 U	400 U	400 U	390 U	420 U	380 U	41 J	NA
Di-n-butylphthalate	6,100,000	800 U	76 J	65 J	68 J	79 J	65 J	420 U	40 B	44 J	NA
Fluoranthene	2,300,000	800 U	420 U	390 U	400 U	400 U	390 U	420 U	380 U	52 J	NA
Pyrene	1,700,000	800 U	420 U	390 U	400 U	400 U	390 U	420 U	380 U	58 J	NA
Pest/PCB (ug/kg)											
4,4'-DDD	2,000	4 UL	4.2 U	3.9 UL	4 UL	4 UL	3.9 UL	4.2 UL	3.8 U	18	NA
4,4'-DDE	1,400	4 UL	5.4 J	3.9 UL	4 UL	4 UL	3.9 UL	4.2 UL	3.8 U	4.1 J	NA
4,4'-DDT	1,700	4 UL	4.2 U	3.9 UL	4 UL	4 UL	3.9 UL	4.2 UL	3.8 U	4.1 J	NA
Aroclor-1260	220	200	310	39 UL	40 UL	40 UL	39 UL	42 UL	38 U	350	NA
Dieldrin	30	4 UL	4.2 U	3.9 UL	4 UL	4 UL	3.9 UL	4.2 UL	3.8 U	9.6 J	NA
Endrin Aldehyde	18,000 [4]	4 UL	4.2 U	3.9 UL	4 UL	4 UL	3.9 UL	4.2 UL	3.8 U	4.1 J	NA
Endrin Ketone	18,000 [4]	4 UL	4.2 U	3.9 UL	4 UL	4 UL	3.9 UL	4.2 UL	3.8 U	9.5 J	NA

Notes:
(1) Composite of soil stockpiled from respirator cartridge removal
(2) Collected from Test Pit 45
(3) Collected from bottom of respirator cartridge removal excavation area
(4) Screening value for endrin used as a surrogate.

Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

TABLE G-12 (cont.)
Analytical Summary of Organic Compounds Detected in Soil
Area of Concern 2 - Dextrose Dump
Cheatham Annex
Williamsburg, Virginia

		Native Soil								
		Test Pit							Bottom of Pit (3)	
Sample ID	**Comparison to**	**A2-TP01-N**	**A2-TP02-N**	**A2-TP03-N**	**A2-TP04-N**	**A2-TP05-N**	**A2-TP05-ND**	**A2-TP06-N**	**A2-CS02**	**A2-CS03**
Sample Date	**Residential RSLs**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**11/12/1999**	**02/03/2000**	**02/03/2000**
Volatiles (ug/kg)										
2-Butanone	28,000,000	7 B	10 UL	5 B	4 B	3 B	10 UL	10 UL	7 J	12 U
Benzene	1,100	12.4 U	10 UL	12.6 U	12.24 U	12.97 U	10 UL	10 UL	14 U	12 U
Ethylbenzene	5,700	12.4 U	10 UL	12.6 U	12.24 U	12.97 U	10 UL	0.7	14 U	12 U
Methylene Chloride	11,000	6 B	37 B	9 B	9 B	9 B	34	27	15 B	11 B
Styrene	6,500	12.4 U	10 UL	12.6 U	12.24 U	12.97 U	10 UL	4	5 J	12 U
Xylene (Total)	600,000	12.4 U	10 UL	12.6 U	1 J	2 J	2	2	14 U	12 U
Semivolatiles (ug/kg)										
Benzo(b)Fluoranthene	150	390 U	410 U	410 U	410 U	410 U	410 U	400 U	440 U	410 U
Bis(2-Ethylhexyl)Phthalate	35,000	390 U	43 J	42 J	410 U	410 U	410 U	400 U	110 J	410 U
Chrysene	15,000	390 U	410 U	410 U	410 U	410 U	410 U	400 U	440 U	410 U
Di-n-butylphthalate	6,100,000	390 U	50 J	46 J	46 J	51 J	410 U	47 J	440 U	410 U
Fluoranthene	2,300,000	390 U	410 U	410 U	410 U	410 U	410 U	400 U	440 U	410 U
Pyrene	1,700,000	390 U	410 U	410 U	410 U	410 U	410 U	400 U	440 U	410 U
Pest/PCB (ug/kg)										
4,4'-DDD	2,000	3.9 U	4.1 U	4.1 UL	4.2 UL	4.1 U	4.2 UL	4 UL	4.4 U	4.1 U
4,4'-DDE	1,400	3.9 U	4.1 U	4.1 UL	4.2 UL	4.1 U	4.2 UL	4 UL	4.4 U	4.1 U
4,4'-DDT	1,700	3.9 U	4.1 U	4.1 UL	4.2 UL	4.1 U	4.2 UL	4 UL	4.4 U	4.1 U
Aroclor-1260	220	39 U	41 U	41 UL	42 UL	41 U	42 UL	40 UL	44 U	41 U
Dieldrin	30	3.9 U	4.1 U	4.1 UL	4.2 UL	4.1 U	4.2 UL	4 UL	4.4 U	4.1 U
Endrin Aldehyde	18,000 (4)	3.9 U	4.1 U	4.1 UL	4.2 UL	4.1 U	4.2 UL	4 UL	4.4 U	4.1 U
Endrin Ketone	18,000 (4)	3.9 U	4.1 U	4.1 UL	4.2 UL	4.1 U	4.2 UL	4 UL	4.4 U	4.1 U

Notes:
(1) Composite of soil stockpiled from respirator cartridge removal
(2) Collected from Test Pit 45
(3) Collected from bottom of respirator cartridge removal excavation area
(4) Screening value for endrin used as a surrogate.

TABLE G-13

Analytical Summary of Inorganic Constituents Detected in Soil

Area of Concern 2 - Dextrose Dump

Cheatham Annex

Williamsburg, Virginia

		Fill Zone								
		Test Pit							Stockpiled Soil (1)	Soil with Asphalt (2)
Sample ID	Comparison to	A2-TP01-F	A2-TP01-FD	A2-TP02-F	A2-TP03-F	A2-TP04-F	A2-TP05-F	A2-TP06-F	A2-CS01	A2-CS04
Sample Date	Residential RSLs	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	02/03/2000	02/04/2000
Inorganics (mg/kg)										
Aluminum	77,000	12,300 L	8,480 L	6,160 L	9,960 L	6,650 L	5,120 L	11,800 L	6,760 J	7,180 J
Antimony	31.0	0.84 B	0.69 B	2 B	12.7 U	0.46 B	11.9 U	11.6 U	0.5 UL	0.45 UL
Arsenic	0.39	3.3	5	3	7.9	9.2	1.9 J	4.3	2 L	3.2 L
Barium	15,000	53.1	35.8	32.2 J	31.7 J	31.6 J	26 J	44.5	30.5 J	27.3 J
Beryllium	160	0.6 B	0.46 B	0.38 B	0.65 B	0.39 B	0.23 B	0.45 B	0.4 J	0.72 J
Cadmium	70.0	2.1 U	1.8 U	12.3	2.1 U	0.9 U	1 U	1 U	1.7 L	0.07 UL
Calcium	--	36,400	13,100	732 J	1,590	1,150	885 J	1,180	1,100 J	63,700 J
Chromium	230 (4)	37.5	17.8	94.5	24.5	15.1	9.2	20.3	35.9 J	19.4 J
Cobalt	--	4.1 J	4 J	3.4 J	5.5 J	3 J	2.7 J	3.8 J	3.4 J	2.2 J
Copper	3,100	58.3	26.7	318	5.3 B	5.5 B	3.1 B	14.6	74.2	2.3 J
Cyanide	1,600	0.6 UL	0.6 UL	0.95 J	0.6 UL	0.6 UL	0.6 UL	0.6 UL	0.02 UL	0.02 UL
Iron	55,000	37,500 L	25,400 L	21,100 L	24,300 L	15,000 L	10,800 L	25,800 L	14,600 L	16,300 L
Lead	400 (5)	11.4	11.2	222	10.3	10.8	8	11.8	62.8 L	9.3 L
Magnesium	--	2,920	825 J	391 J	732 J	432 J	293 J	541 J	451 J	2,410
Manganese	1,800	96.2	112	104	100	94.7	103	121	94 J	85.9 J
Mercury	23.00 (6)	0.04 J	0.04 J	0.03 J	0.03 J	0.04 J	0.06 J	0.05 J	0.02 U	0.03 U
Nickel	1,600	7.2 J	11.2	11.8	12.4	5.1 J	4.3 J	8.4	10.9	5 J
Potassium	--	1120	666 J	312 J	852 J	429 J	332 J	676 J	379 J	1910
Silver	390	11	7 B	19.7	6.5 B	3.9 B	2.7 B	7.1 B	8	3.2
Sodium	--	194 B	70.4 B	25.9 B	30.6 B	31.3 B	20.4 B	32.6 B	50.9 B	356 J
Thallium	5.10	0.79 B	1.8 UL	0.64 B	2.1 UL	1.9 UL	2 UL	0.78 B	0.55 U	0.49 U
Vanadium	390	29.7	23.9	15.4	31.4	20.9	16.8	36.9	17.1	19.9
Zinc	23,000	120	69.9 B	127	44.8 B	60.4 B	23.7 B	96.2	43.5 J	23.8 J

Notes:
(1) Composite of soil stockpiled from respirator cartridge removal
(2) Collected from Test Pit 45
(3) Collected from bottom of respirator cartridge removal excavation area
(4) Screening value for chromium VI used.
(5) Action level for lead
(6) Screening values for mercuric chloride

Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

TABLE G-13 (continued)
Analytical Summary of Inorganic Constituents Detected in Soil
Area of Concern 2 - Dextrose Dump
Cheatham Annex
Williamsburg, Virginia

			Native Soil								
			Test Pit							Bottom of Pit [3]	
	Sample ID	Comparison to	A2-TP01-N	A2-TP02-N	A2-TP03-N	A2-TP04-N	A2-TP05-N	A2-TP05-ND	A2-TP06-N	A2-CS02	A2-CS03
	Sample Date	Residential RSLs	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	11/12/1999	02/03/2000	02/03/2000
	Inorganics (mg/kg)										
7429-90-5	Aluminum	77,000	9,150 L	13,700 L	16,100 L	11,400 L	12,100 L	12,900 L	11,600 L	147,000 J	12,200 J
7440-36-0	Antimony	31.0	0.51 U	0.51 UJ	0.63 J	0.81 B	0.64 B	0.5 B	0.84 B	0.52 UL	0.53 UL
7440-38-2	Arsenic	0.39	9.4	4.2 L	36.5	36.1	16	16	21.2	12.6 L	13.4 L
7440-39-3	Barium	15,000	30.7 J	26.6 J	50.2 J	66	17.2 J	17.5 J	29.7 J	20.9 J	10.9 J
7440-41-7	Beryllium	160	0.59 B	0.9 B	1.3 J	0.81 B	0.96 J	0.92 J	0.97 J	0.1 J	1.3
7440-43-9	Cadmium	70.0	0.08 U	0.16 U	0.17 U	0.08 UL	0.08 UL	0.08 UL	0.08 UL	0.16 UL	0.41 UL
7440-70-2	Calcium	--	801 J	359	494 J	528 J	153 J	183 J	472 J	1,770 J	455 J
7440-47-3	Chromium	230 [4]	23.3	60.3	44	43.3	34.8	38.8	29.8	33.5 J	69.1 J
7440-48-4	Cobalt	--	3.8 J	6.6 J	10.2 J	4.6 J	5.8 J	6.3 J	9.2 J	4.3 J	10.6 J
7440-50-8	Copper	3,100	4.6 B	137 J	6.5 B	5.6 B	6.8 B	6.2 B	134	5.8 J	8
57-12-5	Cyanide	1,600	0.02 UL	0.02 UL	0.02 UL	0.02 UL	0.02 UL	0.02 UL	0.02 UL	0.03 UL	0.02 UL
7439-89-6	Iron	55,000	20,700 L	38,400 L	38,800 L	24,600	33,800	36,700	34,300	36,300 L	99,900 L
7439-92-1	Lead	400 [5]	8.3	14.6 J	12 J	16.2	9	9.1	12.6	14 L	16.1 L
7439-95-4	Magnesium	--	456 J	1,130 J	1,530	1,080 J	954 J	1,020 J	844 J	1,280	623 J
7439-96-5	Manganese	1,800	54.7	73.7 J	84.5 J	13.7	45.6	44.6	70.9	97.7 J	44.8 J
7439-97-6	Mercury	23.00 [6]	0.04 J	0.03 U	0.03 U	0.03 B	0.05 B	0.03 B	0.07 J	0.03 U	0.03 B
7440-02-0	Nickel	1,600	5.8 B	12.1	18.5	7.4 J	14.4	16.3	24.4	11.6	20.5
7440-09-7	Potassium	--	711 J	1,560	1,820	1,650	1,270	1,340	1,130	1250	807 J
7440-22-4	Silver	390	6.8 B	17.8 L	13 L	9 B	11.7 J	13.7 J	12 J	9	23.4
7440-23-5	Sodium	--	18 B	38.5 B	57.5 B	25.9 B	39.5 B	33.9 B	36 B	58.6 B	63.9 B
7440-28-0	Thallium	5.10	0.55 UL	0.84 L	0.58 UL	1.2 B	0.85 B	1.4 B	0.88 B	0.79 J	3.1
7440-62-2	Vanadium	390	41.8	36.8 J	69.2 J	37.6	35.5	35.4	36.7	32	65
7440-66-6	Zinc	23,000	17.9 B	42.5 B	52.4 B	42.8 B	39.8 B	47.9 B	61.4 B	38 J	45.8 J

Notes:
(1) Composite of soil stockpiled from respirator cartridge removal
(2) Collected from Test Pit 45
(3) Collected from bottom of respirator cartridge removal excavation area
(4) Screening value for chromium VI used.
(5) Action level for lead
(6) Screening values for mercuric chloride

Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08

TABLE G-14
Summary of TCLP and RCRA Characterization
Area of Concern 2 - Dextrose Dump
Cheatham Annex
Williamsburg, Virginia

		Characteristics of Hazardous Waste [1]	Aqueous IDW A2-AQWT-01 11/23/1999	Respirator Cartridge A2-CART-01 11/23/1999	Composite of TP01-TP06 A2-TPCOMP-01 11/14/1999
	Volatiles (ug/L)				
75-35-4	1,1-Dichloroethene	700	5 U	5 U	5 U
107-06-2	1,2-Dichloroethane	500	5 U	5 U	5 U
78-93-3	2-Butanone	200,000	10 U	1300 D [2]	10 U
71-43-2	Benzene	500	5 U	370 D [2]	5 U
56-23-5	Carbon Tetrachloride	500	5 U	5 U	5 U
108-90-7	Chlorobenzene	100	5 U	5 U	5 U
67-66-3	Chloroform	6,000	8	5 U	5 U
127-18-4	Tetrachloroethene	700	5 U	5 U	5 U
79-01-6	Trichloroethene	500	5 U	5 U	3 J
75-01-4	Vinyl Chloride	200	5 U	5 U	5 U
	Semivolatiles (ug/L)				
106-46-7	1,4-Dichlorobenzene	7,500	40 U	40 U	40 U
95-95-4	2,4,5-Trichlorophenol	400,000	100 U	100 U	100 U
88-06-2	2,4,6-Trichlorophenol	2,000	40 U	40 U	40 U
121-14-2	2,4-Dinitrotoluene	130	40 U	40 U	40 U
95-48-7	2-Methylphenol	200,000	40 U	40 U	40 U
106-44-5	4-Methylphenol	200,000	40 U	40 U	40 U
118-74-1	Hexachlorobenzene	130	40 U	40 U	40 U
87-68-3	Hexachlorobutadiene	500	40 U	40 U	40 U
67-72-1	Hexachloroethane	3,000	40 U	40 U	40 U
98-95-3	Nitrobenzene	200	40 U	40 U	40 U
87-86-5	Pentachlorophenol	100,000	100 U	100 U	100 U
110-86-1	Pyridine	5,000	40 U	40 U	40 U

Notes:
(1) 40CFR261.20 Subpart C
(2) D indicates extraction dilution
Shading indicates that the detected concentration exceeds the Characteristics of Hazardous Waste value.

TABLE G-14 (continued)
Summary of TCLP and RCRA Characterization
Area of Concern 2 - Dextrose Dump
Cheatham Annex
Williamsburg, Virginia

		Characteristics of Hazardous Waste (1)	Aqueous IDW	Respirator Cartridge	Composite of TP01-TP06
			A2-AQWT-01	A2-CART-01	A2-TPCOMP-01
			11/23/1999	11/23/1999	11/14/1999
	Pesticides (ug/L)				
57-74-9	Chlordane	30	4 U	4 U	4 U
72-20-8	Endrin	20	0.4 U	0.4 U	0.4 U
76-44-8	Heptachlor	8	0.2 U	0.2 U	0.2 U
1024-57-3	Heptachlor Epoxide	8	0.2 U	0.2 U	0.2 U
72-43-5	Methoxychlor	10,000	2 U	2 U	2 U
8001-35-2	Toxaphene	500	20 U	20 U	20 U
58-89-9	gamma-BHC	400	0.2 U	0.2 U	0.2 U
	Herbicides (ug/L)				
93-76-5	2,4,5-T	NA	NA	0.4 U	0.4 U
93-72-1	2,4,5-TP (Silvex)	1,000	NA	0.4 U	0.4 U
94-75-7	2,4-D	10,000	NA	4 U	4 U
88-85-7	Dinoseb	NA	NA	2 U	2 U
	Inorganics (ug/L)				
7440-38-2	Arsenic	5,000	5.8 B	90 U	3.6 U
7440-39-3	Barium	100,000	222 B	398 B	484 B
7440-43-9	Cadmium	1,000	1.1 B	2480	112
7440-47-3	Chromium	5,000	9.3 B	235	63.2
7439-92-1	Lead	5,000	24.5 B	8600	135 B
7439-97-6	Mercury	200	0.11 U	0.11 U	0.2 U
7782-49-2	Selenium	1,000	2.1 U	52.5 U	2.1 U
7440-22-4	Silver	5,000	3.7 U	28.8	14.7
	RCRA Characteristics				
12408-02-5	pH (SU)	2<pH<12.5	NA	NA	6.66
F&O71A-AD-A	Flashpoint (^{o}F)	< 140°F	NA	NA	U
GIS-250-012	Reactive Cyanide (mg/kg)	NA	NA	NA	0.6 U
F&O28A-AA-H	Reactive Sulfide (mg/kg)	NA	NA	NA	1.5 U

Notes:
(1) 40CFR261.20 Subpart C Shading indicates that the detected concentration exceeds the Characteristics of Hazardous Waste value.

TABLE G-15
AOC 6 - 1999 Soil Sampling Results
Cheatham Annex
Williamsburg, Virginia

Sample Location Area	**Residential RSLs-Soil**	Ammonia Settling Pits	TNT Graining House Sump	TNT Graining House Sump	TNT Catch Box Ruins	Metallic Slag Material	1918 Drum Storage Area	1918 Drum Storage Area
Sample ID		PEN1-SO-01[2]	PEN1-SO-03[2]	PEN1-SO-03A[1,2]	PEN1-SO-04[2]	PEN1-SO-07[2]	PEN1-SO-13[2]	PEN1-SO-14[2]
Sample Date		01/12/99	01/12/99	01/12/99	01/12/99	01/12/99	01/13/99	01/12/99
Chemical Name								
Volatile Organic Compounds (UG/KG)								
Chloroform	300.00	4 B	3 B	**10 J**	12 U	14 U	12 U	1 B
Styrene	6,500,000.00	12 U	**2.66666667 J**	20 UJ	12 U	14 U	12 U	11 U
Xylene (total)	600,000.00	**2 J**	20 U	20 UJ	12 U	14 U	12 U	11 U
Semi-volatile Organic Compounds (UG/KG)								
Naphthalene	3,900.00	410 U	660 U	670 U	400 U	**21.5 J**	380 U	380 U
2-Methylnaphthalene	310,000.00	410 U	660 U	670 U	400 U	**45 J**	380 U	380 U
Dibenzofuran	3,900,000.00	410 U	660 U	670 U	400 U	**9.1 J**	380 U	380 U
2,4-Dinitrotoluene	120,000.00	410 U	660 U	670 U	**111.76 J**	480 U	380 U	380 U
Diethyl phthalate	49,000,000.00	410 U	660 U	670 U	400 U	480 U	**3.26 J**	380 U
Phenanthrene	17,000,000.00	410 U	**42 J**	**34 J**	**2.8 J**	**24 J**	380 U	380 U
Di-n-butyl phthalate	6,100,000.00	410 U	660 U	670 U	400 U	480 U	**17 J**	380 U
Fluoranthene	2,300,000.00	410 U	**42 J**	**48 J**	**25 J**	**3 J**	380 U	380 U
Pyrene	1,700,000.00	410 U	**1300**	**1500**	**510**	**5.18 J**	380 U	380 U
Benzo(a)anthracene	150.00	410 U	**97.67 J**	**125.58 J**	**21.86 J**	**7.21 J**	380 U	380 U
Chrysene	15,000.00	410 U	**740**	**840 J**	**30.23 J**	**15.81 J**	380 U	380 U
Benzo(b)fluoranthene	150.00	410 U	**33 J**	**38 J**	**3.6 J**	**6.1 J**	380 U	380 U
Benzo(k)fluoranthene	1,500.00	410 U	**31 J**	**37 J**	**4.5 J**	**5.7 J**	380 U	380 U
Benzo(a)pyrene	15.00	410 U	**47 J**	**55 J**	400 U	480 U	380 U	380 U
Ideno(1,2,3-cd)pyrene	150.00	410 U	**22.47 J**	**22.47 J**	400 U	**7.64 J**	380 U	380 U
Dibenz(a,h)anthracene	15.00	410 U	**15.73 J**	**19.1 J**	400 U	480 U	380 U	380 U
Benzo(g,h,i)perylene	1,500.00	410 U	**26 J**	**35 J**	400 U	**9.6 J**	380 U	380 U
Nitroaromatics (MG/KG)								
2,4,6-Trinitrotoluene	16.00	0.25 U	**26**	**28**	**620**	0.25 U	0.25 U	0.25 U
2-Amino-4,6-dinitrotoluene	120.00	0.25 U	**1.8 J**	1.8 U	18 U	0.25 U	0.25 U	0.25 U
Pesticide/Polychlorinated Biphenyls (UG/KG)								
Endosulfan I	370,000.00	2.1 U	**16 J**	**14 J**	**11 J**	2.5 U	2 U	2 U
Dieldrin	30.00	4.1 U	66 U	**1.35 J**	80 U	4.8 U	3.8 U	3.8 U
4,4'-DDE	2,000.00	**0.066 J**	**0.9 J**	**1.2 J**	**0.48 J**	**0.12 J**	**0.02 J**	**0.017 J**
Endrin	1,800.00	4.1 U	**4 J**	67 U	80 U	**0.15 J**	3.8 U	3.8 U
Endosulfan II	370,000.00	4.1 U	**0.43 J**	67 U	80 U	4.8 U	3.8 U	3.8 U
4,4'-DDD	2,000.00	4.1 U	**0.72 J**	67 U	80 U	**0.45 J**	3.8 U	**0.046**
Endrin ketone	18,000.00	4.1 U	**1.2 J**	**1.8 J**	80 U	**0.16 J**	3.8 U	3.8 U
Endrin aldehyde	18,000.00	4.1 U	66 U	67 U	80 U	**0.3 J**	3.8 U	3.8 U
alpha-Chlordane	1,600.00	**0.18 J**	34 U	35 U	41 U	2.5 U	2 U	**0.033**
Inorganics (MG/KG)								
Aluminum	77,000.00	**9050**	**2150**	**2730**	**7760**	**3080**	**11600**	**9640**
Antimony	31.00	0.94 B	2.9 B	2.2 B	**UL**	**4.6 L**	UL	UL
Arsenic	0.39	**6**	**12.5**	**15.5**	**11**	**33.4**	**4.7**	**5.5**
Barium	15,000.00	**16.8**	**283**	**203**	**34.5**	**261**	**50.4**	**41.9**
Beryllium	160.00	**0.24**	**0.18**	**0.17**	**0.36**	**0.6**	**0.52**	**0.52**
Cadmium	70.00	U	**4**	**4**	UL	UL	UL	**0.22**
Calcium	--	**87.5 J**	**7983.33 J**	**7633.33 J**	**768.33 J**	**7241.67 J**	**2050 J**	**1925**
Chromium	230.00	**14.8**	**14.8**	**22.7**	**15.1**	**32.9**	**21**	**20.2**
Cobalt	--	**2**	**5.3**	**6.4**	**2.4**	**14.9**	**2.8**	**1.8**
Copper	3,100.00	**3.8**	**27.9**	**32.1**	**4.09 J**	**127.27 J**	**9.82**	**3.91**
Iron	55,000.00	**13900**	**70800**	**101000**	**20000**	**256000**	**18500**	**23300**
Lead	400.00	**15**	**7580**	**7750**	**813**	**2600**	**23.6**	**12.9**
Magnesium	--	**408.33 J**	**605 J**	**900 J**	**648**	**824**	**1090**	**977**
Manganese	1,800.00	**25.1**	**705**	**886**	**65.42 J**	**1725 J**	**100**	**29.92**
Mercury	6.70	**0.26**	**0.49**	**0.6**	**0.07**	**0.07**	U	U
Nickel	1,600.00	**4.3**	**15.6**	**17.4**	**5.4**	**34.1**	**5.9**	**3.7**
Potassium	--	**419**	**485**	**570**	**722**	**607**	**836**	**850**
Selenium	390.00	UL	**3.9**	**3.7 L**	U	**3.6**	U	1.1 K
Silver	390.00	**0.45**	**2.7**	**4**	**0.76**	**9.1**	**0.77**	**1**
Sodium	--	**57.4**	**147**	**168**	**74.7**	**356**	**94.5**	**75.2**
Vanadium	390.00	**25.1**	**28**	**31.8**	**22.5**	**18.4**	**25.7**	**26.3**
Zinc	23,000.00	**13.4**	**1010**	**1150**	**87.69 J**	**110.77 J**	**31.85 J**	**138.46 J**
Cyanide	1,600.00	UL	**0.57**	**1.2**	**0.07 L**	**0.64 L**	UL	UL

NOTES:

Detections of a chemical are indicated in bold font.

[1]Duplicate of PEN-SO-03

[2]Data as reported in the *Final Site Inspection Narrative Report, Penniman Shell Loading Plant, Williamsburg, Virginia* by Roy F. Weston, Inc., August 9, 1999.

U = Compound not detected.

J = Analyte present. Reported value may or may not be accurate or precise.

L = Analyte present. Reported value may be biased low. Actual value is expected to be higher.

UL = Not detected, quantitation limit is probably higher.

B = Not detected substantially above the level reported in laboratory or field blanks.

K = Analyte present. Reported value may be biased high. Actual value is expected to be lower.

UJ = Not detected, quantitation limit may be inaccurate or imprecise.

TABLE G-16
AOC 6 - 1999 Surface Water Sampling Results
Cheatham Annex
Williamsburg, Virginia

Sample Location Area	**Residential RSLs-Soil**	Penniman Lake
Sample ID		PEN1-SW-02[1]
Sample Date		01/12/99
Chemical Name		
Volatile Organic Compounds (UG/L)		
No Detections		
Semi-volatile Organic Compounds (UG/L)		
No detections		
Pesticide/Polychlorinated Biphenyls (UG/L)		
No Detections		
Inorganics (UG/L)		
Arsenic	0.39	**4**
Barium	15,000.00	**18.6**
Calcium	--	**50,400**
Iron	55,000.00	**145**
Magnesium	--	**2,100**
Manganese	1,800.00	**13.5**
Potassium	--	**2,900**
Sodium	--	**11,500**

NOTES:

[1]Data as reported in the *Final Site Inspection Narrative Report, Penniman Shell Loading Plant, Williamsburg, Virginia* by Roy F. Weston, Inc., August 9, 1999.

Detections of a chemical are indicated in bold font.

Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

TABLE G-17
AOC 6 - 1999 Sediment Sampling Results
Cheatham Annex,
Williamsburg, Virginia

Sample Location Area	**Residential RSLs-Soil**	Penniman Lake @ suspected point of discharge of runoff from Annomia Settling Pits	Penniman Lake @ suspected point of discharge of runoff from TNT Catch Basin	Penniman Lake @ suspected point of discharge of runoff from TNT Catch Basin
Sample ID		PEN1-SED-01[1]	PEN1-SED-02[1]	PEN1-SED-02A[1]
Sample Date		01/12/99	01/12/99	01/12/99
Chemical Name				
Volatile Organic Compounds (UG/KG)				
Xylene (total)	600,000.00	**0.002 J**	0.014 U	0.013 U
Semi-volatile Organic Compounds (UG/KG)				
Di-n-butylphthalate	6,100,000.00	**0.0047 J**	0.44 U	0.43 U
Nitroaromatics (MG/KG)				
2-Amino-4,6-dinitrotoluene	120.00	0.25 U	**1.8 J**	1.8 U
Pesticide/Polychlorinated Biphenyls (UG/KG)				
Endosulfan I	370,000.00	0.0022 U	**0.000086 J**	0.0022 U
Dieldrin	30.00	0.0042 U	**0.000140323 J**	0.0043 U
4,4'-DDE	2,000.00	0.0042 U	**0.000056 J**	0.0043 U
Endrin	1,800.00	0.0042 U	**0.000164706 J**	**0.00005 J**
Endosulfan sulfate	370,000.00	0.0042 U	0.0045 U	**0.000047 J**
4.4'-DDT	1,700.00	0.0042 U	**0.000135135 J**	**0.000121622 J**
Endrin aldehyde	18,000.00	0.0042 U	**0.000053 J**	**0.00006 J**
Inorganics (MG/KG)				
Aluminum	77,000.00	**9170**	**1270**	**1360**
Arsenic	0.39	**4.8**	**1.4**	**2**
Barium	15,000.00	**21.8**	**5.5**	**6.5**
Beryllium	160.00	**0.26**	**0.09**	**0.09**
Calcium	--	**795 J**	**698.33 J**	**728.33 J**
Chromium	230.00	**12.1**	**2.6**	**3**
Cobalt	--	**1.9**	U	**0.45**
Copper	3,100.00	**3.2**	1 B	1.3 B
Iron	55,000.00	**8320**	**1900**	**2170**
Lead	400.00	**8.1**	**4**	**4.9**
Magnesium	--	**495.83 J**	**100 J**	**114.17 J**
Manganese	1,800.00	**23**	**14.5**	**14.1**
Nickel	1,600.00	**4.2**	**0.84**	**1.4**
Potassium	--	**416**	**130**	**150**
Silver	390.00	**0.23**	U	U
Sodium	--	**71.8**	**30.2**	**60.7**
Vanadium	390.00	**20.2**	**3.6**	**4.2**
Zinc	23,000.00	**15.5**	3.9 B	4.4 B
Cyanide	1,600.00	UL	UL	**0.6 L**

NOTES:

[1]Data as reported in the *Final Site Inspection Narrative Report, Penniman Shell Loading Plant, Williamsburg, Virginia by Roy F. Weston, Inc., August 9, 1999.*

Detections of a chemical are indicated in bold font.

J = Analyte present. Reported value may or may not be accurate or precise.

B = Not detected substantially above the level reported in laboratory or field blanks.

UL = Not detected, quantitation limit is probably higher.

U = Not detected.

Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

TABLE G-18
Analytical Summary of Organic Compounds Detected in Sediment
Site 7 - Old DuPont Disposal Area
Cheatham Annex
Williamsburg, Virginia

Sample ID	Comparison to	7-SD01
Sample Date	Residential RSLs	11/11/1999
Semivolatiles (ug/kg)		
Di-n-Butylphthalate	6,100,000	69 J
Pesticides/PCBs (ug/kg)		
Aroclor-1260	220	540 L

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

TABLE G-19

Analytical Summary of Inorganic Constituents Detected in Sediment

Site 7 - Old DuPont Disposal Area

Cheatham Annex

Williamsburg, Virginia

Sample ID	Comparison to	7-SD01
Sample Date	Residential RSLs	11/11/1999
Inorganics (mg/kg)		
Aluminum	77,000	10,200 L
Arsenic	0.39	5.9
Barium	15,000	36.8 J
Calcium	--	1,970
Chromium	230 (1)	22
Cobalt	--	2.2 J
Iron	55,000	17,000
Lead	400 (2)	21.2
Magnesium	--	1,070 J
Manganese	1,800	59.5
Mercury	23.00 (3)	0.11 J
Nickel	1,600	4.8 J
Potassium	--	1,450
Vanadium	390	35.3

Notes:
(1) Screening value for chromium VI used.
(2) Action level for lead
(3) Screening values for mercuric chloride

Note: Shading indicates that the detected concentration exceeds the Regional Screening Level value for soil (beta version, 5/27/08).

Appendix H
Laboratory Analytical Results

AOC 1

Cheatham Annex
AOC 1
Surface Soil Data Raw Analytical Results
December 2010

Station ID	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07		CAA01-SO08	CAA01-SO09
Sample ID	CAA01-SS01-1108	CAA01-SS02-1108	CAA01-SS02P-1108	CAA01-SS03-1108	CAA01-SS03-1208	CAA01-SS04-1108	CAA01-SS05-1108	CAA01-SS06-1108	CAA01-SS06P-1108	CAA01-SS07-1108	CAA01-SS07-1208	CAA01-SS08-1108	CAA01-SS09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1,1-Trichloroethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,1,2,2-Tetrachloroethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,1,2-Trichloroethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,1-Dichloroethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,1-Dichloroethene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,2,4-Trichlorobenzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,2-Dibromo-3-chloropropane	14 U	13 U	11 U	12 R	NA	14 U	12 U	12 U	11 U	12 R	NA	12 R	12 R
1,2-Dibromoethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,2-Dichlorobenzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,2-Dichloroethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,2-Dichloroethene (total)	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,2-Dichloropropane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,3-Dichlorobenzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
1,4-Dichlorobenzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
2-Butanone	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
2-Hexanone	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
4-Methyl-2-pentanone	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Acetone	3 B	3 B	4 B	3 B	NA	4 B	3 B	2 B	4 B	5 B	NA	4 B	8 B
Benzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Bromodichloromethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Bromoform	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Bromomethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Carbon disulfide	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Carbon tetrachloride	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Chlorobenzene	14 UJ	13 UJ	11 UJ	12 UJ	NA	14 UJ	12 UJ	12 UJ	11 UJ	12 U	NA	12 U	12 U
Chloroethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Chloroform	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Chloromethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
cis-1,2-Dichloroethene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
cis-1,3-Dichloropropene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Cyclohexane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Dibromochloromethane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Dichlorodifluoromethane (Freon-12)	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Ethylbenzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Isopropylbenzene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
m- and p-Xylene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Methyl acetate	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Methylcyclohexane	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Methylene chloride	14 U	13 U	11 U	7 B	NA	14 U	12 U	2 B	3 B	13 B	NA	13 B	11 B
Methyl-tert-butyl ether (MTBE)	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
o-Xylene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Styrene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	3 J
Tetrachloroethene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Toluene	14 U	13 U	11 U	12 UJ	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
trans-1,2-Dichloroethene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
trans-1,3-Dichloropropene	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Trichloroethene	14 U	13 U	11 U	12 UJ	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Trichlorofluoromethane(Freon-11)	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Vinyl chloride	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Xylene, total	14 U	13 U	11 U	12 U	NA	14 U	12 U	12 U	11 U	12 U	NA	12 U	12 U
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2,2'-Oxybis(1-chloropropane)	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2,4,5-Trichlorophenol	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 U	1,000 U
2,4,6-Trichlorophenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2,4-Dichlorophenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2,4-Dimethylphenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U

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Station ID	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07		CAA01-SO08	CAA01-SO09
Sample ID	CAA01-SS01-1108	CAA01-SS02-1108	CAA01-SS02P-1108	CAA01-SS03-1108	CAA01-SS03-1208	CAA01-SS04-1108	CAA01-SS05-1108	CAA01-SS06-1108	CAA01-SS06P-1108	CAA01-SS07-1108	CAA01-SS07-1208	CAA01-SS08-1108	CAA01-SS09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
2,4-Dinitrophenol	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 U	1,000 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
2-Chloronaphthalene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2-Chlorophenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2-Methylnaphthalene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2-Methylphenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
2-Nitroaniline	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 U	1,000 U
2-Nitrophenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
3,3'-Dichlorobenzidine	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
3-Nitroaniline	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 UJ	1,000 UJ
4,6-Dinitro-2-methylphenol	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 U	1,000 U
4-Bromophenyl-phenylether	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
4-Chloro-3-methylphenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
4-Chloroaniline	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
4-Chlorophenyl-phenylether	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
4-Methylphenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
4-Nitroaniline	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 U	1,000 U
4-Nitrophenol	1,200 U	1,000 R	960 U	1,000 R	NA	1,100 U	1,000 U	1,000 R	1,000 R	1,000 R	NA	960 R	1,000 R
Acenaphthene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Acenaphthylene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Acetophenone	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Anthracene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Atrazine	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Benzaldehyde	490 U	420 U	380 U	400 U	NA	260 J	230 J	400 U	400 U	400 U	NA	380 U	400 U
Benzo(a)anthracene	490 U	420 U	380 U	400 U	NA	450 U	330 J	400 U	400 U	400 U	NA	380 U	400 U
Benzo(a)pyrene	490 U	420 U	380 U	400 U	NA	450 U	300 J	400 U	400 U	400 U	NA	380 U	400 U
Benzo(b)fluoranthene	490 U	420 U	380 U	400 U	NA	240 J	740	400 U	400 U	400 U	NA	380 U	400 U
Benzo(g,h,i)perylene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Benzo(k)fluoranthene	490 U	420 U	380 U	400 U	NA	450 U	540	400 U	400 U	400 U	NA	380 U	400 U
bis(2-Chloroethoxy)methane	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
bis(2-Chloroethyl)ether	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
bis(2-Ethylhexyl)phthalate	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Butylbenzylphthalate	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Caprolactam	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Carbazole	490 U	420 U	380 U	400 UJ	NA	450 U	410 U	400 U	400 U	400 U	NA	380 UJ	400 UJ
Chrysene	490 U	420 U	380 U	400 U	NA	450 U	440	400 U	400 U	400 U	NA	380 U	400 U
Dibenz(a,h)anthracene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Dibenzofuran	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Diethylphthalate	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Dimethyl phthalate	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Di-n-butylphthalate	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Di-n-octylphthalate	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Fluoranthene	490 U	420 U	380 U	400 U	NA	450 U	440	400 U	400 U	400 U	NA	380 U	400 U
Fluorene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Hexachlorobenzene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Hexachlorobutadiene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Hexachlorocyclopentadiene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Hexachloroethane	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Indeno(1,2,3-cd)pyrene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Isophorone	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Naphthalene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
n-Nitroso-di-n-propylamine	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
n-Nitrosodiphenylamine	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Nitrobenzene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
Pentachlorophenol	1,200 U	1,000 U	960 U	1,000 U	NA	1,100 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	960 U	1,000 U
Phenanthrene	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Phenol	490 U	420 U	380 U	400 U	NA	450 U	410 U	400 U	400 U	400 U	NA	380 U	400 U
Pyrene	490 U	420 U	380 U	400 U	NA	450 U	840	400 U	400 U	400 U	NA	380 U	400 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													

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Sample ID	CAA01-SS01-1108	CAA01-SS02-1108	CAA01-SS02P-1108	CAA01-SS03-1108	CAA01-SS03-1208	CAA01-SS04-1108	CAA01-SS05-1108	CAA01-SS06-1108	CAA01-SS06P-1108	CAA01-SS07-1108	CAA01-SS07-1208	CAA01-SS08-1108	CAA01-SS09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
4,4'-DDD	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 U	4.2 U	4.1 U	NA	3.9 U	1.7 J	4.5 U
4,4'-DDE	4.7 U	0.23 J	3.8 U	NA	0.72 J	0.45 J	1.1 K	4.2 U	4.1 U	NA	3.9 U	2.8 J	4.5 U
4,4'-DDT	4.7 U	3.8 U	3.8 U	NA	3.5 J	1.8 J	2.6 J	4.2 U	4.1 U	NA	3.9 U	3.8 J	4.5 U
Aldrin	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 UL	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
alpha-BHC	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
alpha-Chlordane	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
Aroclor-1016	47 U	38 U	38 U	NA	43 U	45 U	39 U	42 U	41 U	NA	39 U	39 U	45 U
Aroclor-1221	94 U	76 U	76 U	NA	86 U	90 U	79 U	83 U	81 U	NA	78 U	77 U	90 U
Aroclor-1232	47 U	38 U	38 U	NA	43 U	45 U	39 U	42 U	41 U	NA	39 U	39 U	45 U
Aroclor-1242	47 U	38 U	38 U	NA	43 U	45 U	39 U	42 U	41 U	NA	39 U	39 U	45 U
Aroclor-1248	47 U	38 U	38 U	NA	43 U	45 U	39 U	42 U	41 U	NA	39 U	39 U	45 U
Aroclor-1254	47 U	38 U	38 U	NA	43 U	45 U	39 U	42 U	41 U	NA	39 U	39 U	45 U
Aroclor-1260	47 U	38 U	38 U	NA	43 U	45 U	39 U	42 U	41 U	NA	39 U	39 U	45 U
beta-BHC	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
delta-BHC	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
Dieldrin	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 UL	4.2 U	4.1 U	NA	3.9 U	3.9 U	4.5 U
Endosulfan I	2.4 U	1.9 U	1.9 U	NA	2.2 U	0.29 J	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
Endosulfan II	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 U	4.2 U	4.1 U	NA	3.9 U	3.9 U	4.5 U
Endosulfan sulfate	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 U	4.2 U	4.1 U	NA	3.9 U	3.9 U	4.5 U
Endrin	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	2.7 K	4.2 U	4.1 U	NA	3.9 U	3.9 U	4.5 U
Endrin aldehyde	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	2.1 J	4.2 U	4.1 U	NA	3.9 U	3.9 U	4.5 U
Endrin ketone	4.7 U	3.8 U	3.8 U	NA	4.3 U	4.5 U	3.9 U	4.2 U	4.1 U	NA	3.9 U	3.9 U	4.5 U
gamma-BHC (Lindane)	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 UL	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
gamma-Chlordane	2.4 U	1.9 U	1.9 U	NA	2 J	2.3 U	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
Heptachlor	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 UL	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
Heptachlor epoxide	2.4 U	1.9 U	1.9 U	NA	2.2 U	2.3 U	2 U	2.1 U	2 U	NA	2 U	1.9 U	2.2 U
Methoxychlor	24 U	19 U	19 U	NA	22 U	23 U	20 U	21 U	20 U	NA	20 U	19 U	22 U
Toxaphene	240 U	190 U	190 U	NA	220 U	230 U	200 U	210 U	200 U	NA	200 U	190 U	220 U
Explosives (UG/KG)													
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
3,5-Dinitroaniline	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	NA	100 U	99 U	100 U	100 U	99 U	NA	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
HMX	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
Nitroglycerin	7,000 U	5,700 U	5,700 U	5,800 U	NA	6,800 U	5,900 U	6,200 U	6,100 U	6,600 U	NA	5,800 U	6,700 U
Nitroguanidine	130 U	120 U	130 U	130 U	NA	120 U	130 U	130 U	130 U	130 U	NA	250 U	250 U
PETN	500 U	500 U	500 U	500 U	NA	500 U	500 U	500 U	500 U	500 U	NA	500 U	500 U
RDX	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
Total Metals (MG/KG)													
Aluminum	8,670	6,780	5,490	8,280	NA	8,400	5,880	18,200	12,200	8,510	NA	8,940	6,140
Antimony	0.08 L	7.3 UL	5.2 UL	6.4 UL	NA	1.2 L	5.4 UL	0.24 L	0.11 L	5.6 UL	NA	5.4 UL	5.9 UL
Arsenic	3.3 L	4.4 L	3.9 L	4 L	NA	47.5 L	2.4 L	2.5 L	1.6 L	2.1 L	NA	2.7	1.5
Barium	41.2	46.9	41	42.9 K	NA	82	49.6	30.3	25.2	30.3 K	NA	39.9	19.3 J
Beryllium	0.56	0.65	0.58	0.5 J	NA	0.54	0.39 J	0.23 J	0.17 J	0.48	NA	0.44 J	0.33 J
Cadmium	0.11 J	0.12 J	0.06 J	0.01 B	NA	0.56	0.12 J	0.35 U	0.32 U	0.03 B	NA	0.04 B	0.49 U
Calcium	19,200	1,380	1,350	2,320	NA	11,600	2,150	1,720	1,900	4,610	NA	2,470	317 J
Chromium	11.2	8.1	6.7	11.6	NA	20.8	7.7	18.9	13	7.1	NA	11.9	5.3
Cobalt	3.5 J	9 J	7.9 J	3.3 J	NA	3.8 J	3.2 J	1.1 J	0.86 J	3.8 J	NA	2.2 J	1.8 J
Copper	4.7	3.9	3	8.9	NA	33	4	2.2	1.7	3	NA	6.7	2.3 J
Cyanide	0.65 U	0.6 U	0.55 U	0.6 U	NA	29	0.6 U	0.55 U	0.6 U	0.55 U	NA	0.55 U	0.6 U
Iron	6,840	8,000	7,240	11,000	NA	14,200	5,950	12,500	7,460	4,160	NA	8,440	3,320
Lead	13.1	16.6	14.4	30	NA	83.7	26.6	7.4	8	10.9	NA	35.2	14
Magnesium	1,280 J	426 J	371 J	991	NA	1,060 J	421 J	514 J	374 J	521	NA	1,270	299 J

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Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
Manganese	57.8 L	153 L	138 L	120 L	NA	387 L	145 L	31.8 L	30.3 L	92.7 L	NA	119	29.7
Mercury	0.13 U	0.13 U	0.12 U	0.12 UL	NA	0.09 J	0.12 U	0.12 U	0.07 J	0.12 UL	NA	0.04 B	0.05 B
Nickel	5.4 J	5.6 J	4.8 J	5.9	NA	6.6 J	3.8 J	3 J	2.4 J	3.8	NA	3.9	2.8 J
Potassium	417 J	436 J	338 J	606 J	NA	707 J	394 J	569 J	391 J	331 J	NA	487	236 J
Selenium	3.3 UL	4.3 UL	3 UL	3.8 U	NA	3.4 UL	3.2 UL	0.31 L	2.2 UL	3.3 U	NA	3.2 U	3.4 U
Silver	0.95 U	1.2 U	0.87 U	1.1 U	NA	0.24 J	0.9 U	0.08 J	0.07 J	0.94 U	NA	0.18 J	0.07 J
Sodium	42.7 J	27.3 J	17.8 J	31.4 B	NA	48.1 J	18.5 J	27.8 J	21 B	25.8 B	NA	29.6 B	17.7 B
Thallium	2.4 U	3.1 U	2.2 U	0.12 B	NA	2.4 U	2.2 U	0.26 B	0.13 B	2.3 U	NA	2.3 U	2.4 U
Vanadium	13.3	13.2	11.2	19.2	NA	17.6	12	40.8	23.1	11.1	NA	16.4	10.7
Zinc	34.5 L	30.2 L	24.8 L	35.8 K	NA	316 L	51.4 L	14.8 L	16.7 L	19.6 K	NA	36.3	11.3
Wet Chemistry													
% Solids (pct)	68	79	86	82	77	73	81	82	82	82	85	86	83
pH (ph)	8.2	6.3	NA	6.4	NA	7.9	7.1	6.4	NA	8.4	NA	7.3	5.3
Total organic carbon (TOC) (ug/g)	39,000	44,000	NA	54,000	NA	110,000	38,000	30,000	NA	9,200	NA	18,000	28,000

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 1\[1_AOC1_SS_raw.xls], Victoria Brynildsen, 12/01/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA01-SO10	CAA01-SO11	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SS10-1108	CAA01-SS11-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108	CAA01-SS16-1108	CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,1,2,2-Tetrachloroethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,1,2-Trichloroethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,1-Dichloroethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,1-Dichloroethene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,2,4-Trichlorobenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,2-Dibromo-3-chloropropane	13 R	17 R	14 R	13 R	13 R	15 R	12 R	17 U	16 U	15 U	13 U
1,2-Dibromoethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,2-Dichlorobenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,2-Dichloroethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,2-Dichloroethene (total)	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,2-Dichloropropane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,3-Dichlorobenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
1,4-Dichlorobenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
2-Butanone	13 U	17 U	14 U	13 U	13 U	8 J	12 U	17 U	7 J	3 J	13 U
2-Hexanone	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
4-Methyl-2-pentanone	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Acetone	3 B	10 B	9 B	14 B	10 B	95 B	8 B	7 B	34	15 B	13 U
Benzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Bromodichloromethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Bromoform	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Bromomethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Carbon disulfide	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Carbon tetrachloride	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Chlorobenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Chloroethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Chloroform	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Chloromethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
cis-1,2-Dichloroethene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
cis-1,3-Dichloropropene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Cyclohexane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Dibromochloromethane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Dichlorodifluoromethane (Freon-12)	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Ethylbenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Isopropylbenzene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
m- and p-Xylene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Methyl acetate	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Methylcyclohexane	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Methylene chloride	5 B	6 B	3 B	4 B	4 B	6 B	2 B	17 U	4 B	3 B	3 B
Methyl-tert-butyl ether (MTBE)	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
o-Xylene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Styrene	33	17 U	14 U	13 U	13 U	15 U	3 J	17 U	16 U	15 U	13 U
Tetrachloroethene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Toluene	13 U	17 U	14 U	2 J	13 U	15 U	12 U	17 U	16 U	15 U	13 U
trans-1,2-Dichloroethene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
trans-1,3-Dichloropropene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Trichloroethene	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Trichlorofluoromethane(Freon-11)	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Vinyl chloride	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Xylene, total	13 U	17 U	14 U	13 U	13 U	15 U	12 U	17 U	16 U	15 U	13 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2,2'-Oxybis(1-chloropropane)	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2,4,5-Trichlorophenol	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
2,4,6-Trichlorophenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2,4-Dichlorophenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2,4-Dimethylphenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U

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Station ID	CAA01-SO10	CAA01-SO11	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SS10-1108	CAA01-SS11-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108	CAA01-SS16-1108	CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name											
2,4-Dinitrophenol	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2-Chloronaphthalene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2-Chlorophenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2-Methylnaphthalene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2-Methylphenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
2-Nitroaniline	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
2-Nitrophenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
3,3'-Dichlorobenzidine	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
3-Nitroaniline	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
4,6-Dinitro-2-methylphenol	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
4-Bromophenyl-phenylether	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
4-Chloro-3-methylphenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
4-Chloroaniline	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
4-Chlorophenyl-phenylether	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
4-Methylphenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
4-Nitroaniline	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
4-Nitrophenol	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
Acenaphthene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Acenaphthylene	410 U	560 UL	460 U	420 U	460 U	360 J	400 U	570 U	520 U	550 U	420 U
Acetophenone	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Anthracene	410 U	560 UL	460 U	420 U	460 U	800	400 U	570 U	520 U	550 U	420 U
Atrazine	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Benzaldehyde	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Benzo(a)anthracene	410 U	370 L	460 U	420 U	460 U	1,900	400 U	570 U	520 U	550 U	420 U
Benzo(a)pyrene	410 U	750 L	460 U	420 U	460 U	1,500	400 U	570 U	520 U	550 U	420 U
Benzo(b)fluoranthene	410 U	2,400 L	460 U	420 U	460 U	1,400	400 U	570 U	520 U	550 U	420 U
Benzo(g,h,i)perylene	410 U	1,000 L	460 U	420 U	460 U	820	400 U	570 U	520 U	550 U	420 U
Benzo(k)fluoranthene	410 U	820 L	460 U	420 U	460 U	1,100	400 U	570 U	520 U	550 U	420 U
bis(2-Chloroethoxy)methane	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
bis(2-Chloroethyl)ether	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
bis(2-Ethylhexyl)phthalate	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	450 J	520 U	550 U	790
Butylbenzylphthalate	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Caprolactam	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Carbazole	410 U	560 UL	460 U	420 U	460 U	610	400 U	570 U	520 U	550 U	420 U
Chrysene	410 U	1,400 L	460 U	420 U	460 U	1,800	400 U	570 U	520 U	550 U	420 U
Dibenz(a,h)anthracene	410 U	330 L	460 U	420 U	460 U	270 J	400 U	570 U	520 U	550 U	420 U
Dibenzofuran	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Diethylphthalate	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Dimethyl phthalate	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Di-n-butylphthalate	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Di-n-octylphthalate	410 UJ	560 UL	460 UJ	420 UJ	460 UJ	520 UJ	400 UJ	570 U	520 U	550 U	420 U
Fluoranthene	410 U	560 UL	460 U	420 U	460 U	4,900	400 U	570 U	520 U	550 U	420 U
Fluorene	410 U	560 UL	460 U	420 U	460 U	660	400 U	570 U	520 U	550 U	420 U
Hexachlorobenzene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Hexachlorobutadiene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Hexachlorocyclopentadiene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Hexachloroethane	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Indeno(1,2,3-cd)pyrene	410 U	750 L	460 U	420 U	460 U	780	400 U	570 U	520 U	550 U	420 U
Isophorone	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Naphthalene	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
n-Nitroso-di-n-propylamine	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
n-Nitrosodiphenylamine	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Nitrobenzene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
Pentachlorophenol	1,000 U	1,400 UL	1,200 U	1,100 U	1,100 U	1,300 U	1,000 U	1,400 U	1,300 U	1,400 U	1,100 U
Phenanthrene	410 U	560 UL	460 U	420 U	460 U	5,200	400 U	570 U	520 U	550 U	420 U
Phenol	410 U	560 UL	460 U	420 U	460 U	520 U	400 U	570 U	520 U	550 U	420 U
Pyrene	410 U	290 L	460 U	420 U	460 U	4,400	400 U	570 U	520 U	550 U	420 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											

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Station ID	CAA01-SO10	CAA01-SO11	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SS10-1108	CAA01-SS11-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108	CAA01-SS16-1108	CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name											
4,4'-DDD	4 U	5.1 U	4.3 U	0.67 J	0.58 J	1 J	4.1 U	0.23 J	4.9 U	5.4 U	4.2 U
4,4'-DDE	4 U	1.8 J	4.3 U	0.43 J	0.56 J	4.9 U	4.1 U	0.34 J	4.9 U	5.4 U	4.2 U
4,4'-DDT	4 U	4.7 J	4.3 U	0.53 J	1.4 J	4.9 U	4.1 U	1.2 J	4.9 U	5.4 U	4.2 U
Aldrin	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
alpha-BHC	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
alpha-Chlordane	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
Aroclor-1016	40 U	51 U	43 U	43 U	46 U	49 U	41 U	57 U	49 U	54 U	42 U
Aroclor-1221	80 U	100 U	86 U	85 U	93 U	99 U	81 U	110 U	98 U	110 U	84 U
Aroclor-1232	40 U	51 U	43 U	43 U	46 U	49 U	41 U	57 U	49 U	54 U	42 U
Aroclor-1242	40 U	51 U	43 U	43 U	46 U	49 U	41 U	57 U	49 U	54 U	42 U
Aroclor-1248	40 U	51 U	43 U	43 U	46 U	49 U	41 U	57 U	49 U	54 U	42 U
Aroclor-1254	40 U	51 U	43 U	43 U	46 U	49 U	41 U	57 U	49 U	54 U	42 U
Aroclor-1260	40 U	51 U	43 U	43 U	46 U	49 U	41 U	57 U	49 U	54 U	42 U
beta-BHC	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
delta-BHC	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
Dieldrin	4 U	5.1 U	4.3 U	4.3 U	4.6 U	0.46 J	4.1 U	5.7 U	4.9 U	5.4 U	4.2 U
Endosulfan I	2 U	2.6 U	2.2 U	0.29 J	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
Endosulfan II	4 U	5.1 U	4.3 U	4.3 U	4.6 U	4.9 U	4.1 U	5.7 U	4.9 U	5.4 U	4.2 U
Endosulfan sulfate	4 U	5.1 U	4.3 U	4.3 U	4.6 U	4.9 U	4.1 U	5.7 U	4.9 U	5.4 U	4.2 U
Endrin	4 U	3.3 J	4.3 U	4.3 U	4.6 U	4.9 U	4.1 U	5.7 U	4.9 U	5.4 U	4.2 U
Endrin aldehyde	4 U	3.1 J	4.3 U	1.9 J	4.6 U	4.9 U	4.1 U	5.7 U	4.9 U	5.4 U	4.2 U
Endrin ketone	4 U	5.1 U	4.3 U	4.3 U	4.6 U	4.9 U	4.1 U	5.7 U	4.9 U	5.4 U	4.2 U
gamma-BHC (Lindane)	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
gamma-Chlordane	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	1.9 J	2.8 U	2.5 U	2.7 U	2.1 U
Heptachlor	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
Heptachlor epoxide	2 U	2.6 U	2.2 U	2.1 U	2.3 U	2.5 U	2 U	2.8 U	2.5 U	2.7 U	2.1 U
Methoxychlor	20 U	26 U	22 U	21 U	23 U	25 U	20 U	28 U	25 U	27 U	21 U
Toxaphene	200 U	260 U	220 U	210 U	230 U	250 U	200 U	280 U	250 U	270 U	210 U
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	6,000 U	7,700 U	6,500 U	6,400 U	7,000 U	7,400 U	6,100 U	8,500 U	7,400 U	8,000 U	6,300 U
Nitroguanidine	250 U	250 U	250 U	250 U	250 U	250 U	250 U	120 U	130 U	120 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	490 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)											
Aluminum	11,300	11,400	8,180	11,400	13,900	6,200	7,310	9,230	5,780	6,250	6,340
Antimony	3.8 UL	1 L	4.5 UL	6.4 UL	2 L	6.3 L	6.6 UL	1.6 L	0.1 L	0.12 L	6.4 UL
Arsenic	1.9	16.8	1.9	3.8	5.6	7.8	4.5	5.4	12	21.8	6.9
Barium	13.7	124	33.7	56.6	53.4	90.2	22.5	76.6	23.8 J	32.3	29.6
Beryllium	0.15 J	0.78	0.34 J	0.54	0.64	0.42 J	0.4 J	0.42 J	0.23 J	0.26 J	0.24 J
Cadmium	0.32 U	1.3	0.11 J	0.09 J	2	1.5	0.08 J	0.62 J	0.21 J	0.38 J	0.21 J
Calcium	1,020	24,300	1,470	6,690	11,600	11,900	1,200	9,560 J	4,920 J	5,590 J	2,680 J
Chromium	11.9	48.7	8.1	13.8	18.4	13.4	13.6	8.2	8.5	9.1	7.4
Cobalt	0.67 J	3.9 J	1.6 J	2.8 J	3.9 J	4.6 J	2.7 J	3.8 J	2.6 J	2.9 J	2.2 J
Copper	2.3	17.5	5.8	18.3	70	88.5	3.2	45.8	4.4	5.5	7.4
Cyanide	0.55 U	0.85 U	0.6 U	0.6 U	0.65 U	0.51 J	0.55 U	0.4 L	0.75 UL	0.8 UL	0.6 UL
Iron	9,570	17,000	5,500	10,600	22,400	32,300	17,100	14,700	12,900	18,900	9,550
Lead	8.3	121	21.3	39.4	351	698	12.4	151	11.2	14.1	10.3
Magnesium	289 J	1,890	414	986	1,230	803 J	550	609 J	350 J	442 J	365 J

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Station ID	CAA01-SO10	CAA01-SO11	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SS10-1108	CAA01-SS11-1108	CAA01-SS12-1108	CAA01-SS13-1108	CAA01-SS14-1108	CAA01-SS15-1108	CAA01-SS16-1108	CAA01-SS17-1208	CAA01-SS18-1208	CAA01-SS18P-1208	CAA01-SS19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name											
Manganese	17.4	426	179	384	281	394	51.7	285	98.1	145	358
Mercury	0.11 U	0.15	0.09 B	0.12	0.08 B	0.14 J	0.05 B	0.11 L	0.15 UL	0.18 UL	0.12 UL
Nickel	1.6 J	8.9	3.3	5.9	8.5	12.9	4.6	6.1 J	3.5 J	3.9 J	3.1 J
Potassium	268 J	893	347 J	528 J	1,150	416 J	750	378 J	331 J	371 J	336 J
Selenium	2.2 U	4.9 U	2.6 U	3.8 U	0.51 B	0.95 B	3.8 U	5.7 U	4.7 U	5.2 U	3.7 U
Silver	0.2 J	0.55 J	0.14 J	0.3 J	0.9 U	0.26 J	1.1 U	0.15 J	1.3 U	1.5 U	0.18 J
Sodium	15.4 B	64.1 B	22.3 B	32.6 B	49.2 B	32.1 B	23.3 B	28.7 B	23.6 B	26.1 B	18.9 B
Thallium	0.08 B	3.5 U	1.9 U	2.7 U	2.2 U	5.1 U	2.7 U	0.15 B	0.2 B	0.12 B	0.18 B
Vanadium	30	22.8	14	20.2	30	15.9	23	13.8	14.4	15.8	10.6
Zinc	6.8	872	26.3	55.2	162	477	26.6	115	100	157	63.7
Wet Chemistry											
% Solids (pct)	80	59	71	78	72	63	82	59	68	62	80
pH (ph)	5.7	7.5	6.7	7.8	7.9	6.6	7.3	7.5	7.5	7.6	7.8
Total organic carbon (TOC) (ug/g)	1,200	140,000	31,000	29,000	64,000	140,000	27,000	110,000	38,000	77,000	15,000

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07		CAA01-SO08	CAA01-SO09
Sample ID	CAA01-SB01-1108	CAA01-SB02-1108	CAA01-SB02P-1108	CAA01-SB03-1108	CAA01-SB03-1208	CAA01-SB04-1108	CAA01-SB05-1108	CAA01-SB06-1108	CAA01-SB06P-1108	CAA01-SB07-1108	CAA01-SB07-1208	CAA01-SB08-1108	CAA01-SB09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1,1-Trichloroethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,1,2,2-Tetrachloroethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,1,2-Trichloroethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,1-Dichloroethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,1-Dichloroethene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,2,4-Trichlorobenzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,2-Dibromo-3-chloropropane	14 U	11 U	11 U	11 R	NA	11 U	12 U	12 U	12 U	13 R	NA	11 R	10 R
1,2-Dibromoethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,2-Dichlorobenzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,2-Dichloroethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,2-Dichloroethene (total)	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,2-Dichloropropane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,3-Dichlorobenzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
1,4-Dichlorobenzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
2-Butanone	2 J	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
2-Hexanone	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
4-Methyl-2-pentanone	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Acetone	10 B	12 B	6 B	2 B	NA	4 B	4 B	3 B	3 B	4 B	NA	3 B	3 B
Benzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Bromodichloromethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Bromoform	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Bromomethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Carbon disulfide	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Carbon tetrachloride	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Chlorobenzene	14 UJ	11 UJ	11 UJ	11 UJ	NA	11 UJ	12 UJ	12 UJ	12 UJ	13 U	NA	11 U	10 U
Chloroethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Chloroform	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Chloromethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
cis-1,2-Dichloroethene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
cis-1,3-Dichloropropene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Cyclohexane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Dibromochloromethane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Dichlorodifluoromethane (Freon-12)	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Ethylbenzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Isopropylbenzene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
m- and p-Xylene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Methyl acetate	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Methylcyclohexane	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Methylene chloride	3 B	11 U	11 U	8 B	NA	11 U	12 U	9 B	4 B	12 B	NA	13 B	10 B
Methyl-tert-butyl ether (MTBE)	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
o-Xylene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Styrene	14 U	2 J	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	1 J
Tetrachloroethene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Toluene	14 U	2 J	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
trans-1,2-Dichloroethene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
trans-1,3-Dichloropropene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Trichloroethene	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Trichlorofluoromethane(Freon-11)	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Vinyl chloride	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Xylene, total	14 U	11 U	11 U	11 U	NA	11 U	12 U	12 U	12 U	13 U	NA	11 U	10 U
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2,2'-Oxybis(1-chloropropane)	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2,4,5-Trichlorophenol	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 U	880 U
2,4,6-Trichlorophenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2,4-Dichlorophenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2,4-Dimethylphenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U

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Station ID	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07		CAA01-SO08	CAA01-SO09
Sample ID	CAA01-SB01-1108	CAA01-SB02-1108	CAA01-SB02P-1108	CAA01-SB03-1108	CAA01-SB03-1208	CAA01-SB04-1108	CAA01-SB05-1108	CAA01-SB06-1108	CAA01-SB06P-1108	CAA01-SB07-1108	CAA01-SB07-1208	CAA01-SB08-1108	CAA01-SB09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
2,4-Dinitrophenol	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 U	880 U
2,4-Dinitrotoluene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
2,6-Dinitrotoluene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
2-Chloronaphthalene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2-Chlorophenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2-Methylnaphthalene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2-Methylphenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
2-Nitroaniline	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 U	880 U
2-Nitrophenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
3,3'-Dichlorobenzidine	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
3-Nitroaniline	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 UJ	880 UJ
4,6-Dinitro-2-methylphenol	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 U	880 U
4-Bromophenyl-phenylether	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
4-Chloro-3-methylphenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
4-Chloroaniline	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
4-Chlorophenyl-phenylether	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
4-Methylphenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
4-Nitroaniline	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 U	880 U
4-Nitrophenol	1,100 R	940 U	920 U	900 R	NA	900 U	970 U	980 R	980 R	1,100 R	NA	930 R	880 R
Acenaphthene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Acenaphthylene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Acetophenone	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Anthracene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Atrazine	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Benzaldehyde	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Benzo(a)anthracene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Benzo(a)pyrene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Benzo(b)fluoranthene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Benzo(g,h,i)perylene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Benzo(k)fluoranthene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
bis(2-Chloroethoxy)methane	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
bis(2-Chloroethyl)ether	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
bis(2-Ethylhexyl)phthalate	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Butylbenzylphthalate	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Caprolactam	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Carbazole	450 U	370 U	370 U	360 UJ	NA	360 U	390 U	390 U	390 U	430 U	NA	370 UJ	350 UJ
Chrysene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Dibenz(a,h)anthracene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Dibenzofuran	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Diethylphthalate	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Dimethyl phthalate	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Di-n-butylphthalate	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Di-n-octylphthalate	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Fluoranthene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Fluorene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Hexachlorobenzene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Hexachlorobutadiene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Hexachlorocyclopentadiene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Hexachloroethane	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Indeno(1,2,3-cd)pyrene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Isophorone	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Naphthalene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
n-Nitroso-di-n-propylamine	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
n-Nitrosodiphenylamine	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Nitrobenzene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
Pentachlorophenol	1,100 U	940 U	920 U	900 U	NA	900 U	970 U	980 U	980 U	1,100 U	NA	930 U	880 U
Phenanthrene	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Phenol	450 U	370 U	370 U	360 U	NA	360 U	390 U	390 U	390 U	430 U	NA	370 U	350 U
Pyrene	450 U	370 U	370 U	360 U	NA	360 U	120 J	390 U	390 U	430 U	NA	370 U	350 U
Pesticide/Polychlorinated Biphenyls (UG/KG)													

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Station ID	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07		CAA01-SO08	CAA01-SO09
Sample ID	CAA01-SB01-1108	CAA01-SB02-1108	CAA01-SB02P-1108	CAA01-SB03-1108	CAA01-SB03-1208	CAA01-SB04-1108	CAA01-SB05-1108	CAA01-SB06-1108	CAA01-SB06P-1108	CAA01-SB07-1108	CAA01-SB07-1208	CAA01-SB08-1108	CAA01-SB09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
4,4'-DDD	4.2 U	3.7 U	3.7 U	NA	0.87 J	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	5.2	3.5 U
4,4'-DDE	0.23 J	3.7 U	3.7 U	NA	1.6 J	0.27 J	3.6 U	3.9 U	4 U	NA	4 U	26	3.5 U
4,4'-DDT	4.2 U	3.7 U	3.7 U	NA	3.4 J	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	15	3.5 U
Aldrin	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
alpha-BHC	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
alpha-Chlordane	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
Aroclor-1016	42 U	37 U	37 U	NA	39 U	36 U	36 U	39 U	40 U	NA	40 U	38 U	35 U
Aroclor-1221	83 U	74 U	74 U	NA	77 U	72 U	73 U	78 U	80 U	NA	80 U	76 U	71 U
Aroclor-1232	42 U	37 U	37 U	NA	39 U	36 U	36 U	39 U	40 U	NA	40 U	38 U	35 U
Aroclor-1242	42 U	37 U	37 U	NA	39 U	36 U	36 U	39 U	40 U	NA	40 U	38 U	35 U
Aroclor-1248	42 U	37 U	37 U	NA	39 U	36 U	36 U	39 U	40 U	NA	40 U	38 U	35 U
Aroclor-1254	42 U	37 U	37 U	NA	39 U	36 U	36 U	39 U	40 U	NA	40 U	38 U	35 U
Aroclor-1260	42 U	37 U	37 U	NA	39 U	36 U	36 U	39 U	40 U	NA	40 U	38 U	35 U
beta-BHC	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
delta-BHC	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
Dieldrin	4.2 U	3.7 U	3.7 U	NA	3.9 U	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	3.8 U	3.5 U
Endosulfan I	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
Endosulfan II	4.2 U	3.7 U	3.7 U	NA	3.9 U	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	3.8 U	3.5 U
Endosulfan sulfate	4.2 U	3.7 U	3.7 U	NA	3.9 U	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	3.8 U	3.5 U
Endrin	4.2 U	3.7 U	3.7 U	NA	3.9 U	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	3.8 U	3.5 U
Endrin aldehyde	4.2 U	3.7 U	3.7 U	NA	3.9 U	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	3.8 U	3.5 U
Endrin ketone	4.2 U	3.7 U	3.7 U	NA	3.9 U	3.6 U	3.6 U	3.9 U	4 U	NA	4 U	3.8 U	3.5 U
gamma-BHC (Lindane)	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
gamma-Chlordane	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
Heptachlor	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
Heptachlor epoxide	2.1 U	1.8 U	1.8 U	NA	1.9 U	1.8 U	1.8 U	2 U	2 U	NA	2 U	1.9 U	1.8 U
Methoxychlor	21 U	18 U	18 U	NA	19 U	18 U	18 U	20 U	20 U	NA	20 U	19 U	18 U
Toxaphene	210 U	180 U	180 U	NA	190 U	180 U	180 U	200 U	200 U	NA	200 U	190 U	180 U
Explosives (UG/KG)													
1,3,5-Trinitrobenzene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
1,3-Dinitrobenzene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
2,4,6-Trinitrotoluene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
2-Amino-4,6-dinitrotoluene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
3,5-Dinitroaniline	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
4-Amino-2,6-dinitrotoluene	99 U	100 U	100 U	100 U	NA	100 U	100 U	100 U	100 U	100 U	NA	100 U	99 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
HMX	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
Nitroglycerin	6,200 U	5,500 U	5,500 U	5,500 U	NA	5,400 U	5,400 U	5,900 U	6,000 U	6,600 U	NA	5,700 U	5,300 U
Nitroguanidine	120 U	130 U	130 U	130 U	NA	120 U	130 U	120 U	120 U	130 U	NA	250 U	250 U
PETN	490 U	500 U	500 U	500 U	NA	500 U	500 U	500 U	500 U	500 U	NA	500 U	490 U
RDX	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	NA	200 U	200 U	200 U	200 U	200 U	NA	200 U	200 U
Total Metals (MG/KG)													
Aluminum	7,560	8,540	7,980	10,400	NA	5,680	6,130	19,200	18,600	7,680	NA	10,500	5,370
Antimony	0.09 L	5.1 UL	4.9 UL	5.5 UL	NA	4 UL	6.1 UL	3.8 UL	5.5 UL	3.9 UL	NA	3.7 UL	3.9 UL
Arsenic	1.6 L	6 L	6.8 L	5.3 L	NA	2 L	2 L	1.7 L	2.2 L	2.1 L	NA	4.9	1.1
Barium	27	28.1	28.8	42.2 K	NA	25.3	26	15.3	20.2	26.2 K	NA	26.3	15.8
Beryllium	0.33 J	0.89	0.98	0.5	NA	0.35	0.37 J	0.13 J	0.17 J	0.58	NA	0.51	0.24 J
Cadmium	0.04 J	0.43 U	0.41 U	0.46 U	NA	0.03 J	0.02 B	0.32 U	0.46 U	0.02 B	NA	0.31 U	0.32 U
Calcium	16,400	572	566	2,740	NA	1,150	790	1,460	1,420	754	NA	2,470	93.4 J
Chromium	8.5	13.2	12.5	15.5	NA	6.9	7.4	18	18.6	6.2	NA	14.2	4.8
Cobalt	2.1 J	8.4 J	8.1 J	3 J	NA	2.8 J	3.4 J	0.52 J	0.76 J	6.7	NA	6.4	1.7 J
Copper	3.6	3.1	2.9	11	NA	2.2	2.6 J	1.5 J	1.8 B	2	NA	4.7	1.3 J
Cyanide	0.55 U	0.5 U	0.5 U	0.5 U	NA	0.55 U	10	0.6 U	0.6 U	0.6 U	NA	0.55 U	0.5 U
Iron	4,740	16,200	17,600	16,900	NA	6,800	5,770	10,500	11,500	3,980	NA	13,600	2,470
Lead	7.5	9.7	10.4	41.2	NA	14.2	9.6	5.3	6.1	8	NA	22.2	6.9
Magnesium	922 J	532 J	464 J	1,060	NA	310 J	276 J	407 J	468 J	313 J	NA	1,200	246 J

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Station ID	CAA01-SO01	CAA01-SO02		CAA01-SO03		CAA01-SO04	CAA01-SO05	CAA01-SO06		CAA01-SO07		CAA01-SO08	CAA01-SO09
Sample ID	CAA01-SB01-1108	CAA01-SB02-1108	CAA01-SB02P-1108	CAA01-SB03-1108	CAA01-SB03-1208	CAA01-SB04-1108	CAA01-SB05-1108	CAA01-SB06-1108	CAA01-SB06P-1108	CAA01-SB07-1108	CAA01-SB07-1208	CAA01-SB08-1108	CAA01-SB09-1108
Sample Date	11/03/08	11/03/08	11/03/08	11/05/08	12/18/08	11/03/08	11/03/08	11/04/08	11/04/08	11/05/08	12/18/08	11/07/08	11/07/08
Chemical Name													
Manganese	36.1 L	82.6 L	88.9 L	98.4 L	NA	42.9 L	49.8 L	10.3 L	14.2 L	57.9 L	NA	106	21
Mercury	0.1 U	0.11 U	0.1 U	0.1 UL	NA	0.11 U	0.12 U	0.12 U	0.099 U	0.12 UL	NA	0.11 U	0.11 U
Nickel	3.6 J	9.7 J	8.6 J	6.6	NA	3.1 J	3.1 J	2.6 J	2.6 J	4.7	NA	5.6	2.3 J
Potassium	318 J	604 J	516 J	732 J	NA	306 J	318 J	469 J	512 J	246 J	NA	681	176 J
Selenium	2.5 UL	3 UL	2.8 UL	0.44 J	NA	2.3 UL	3.6 UL	2.2 UL	3.2 UL	2.3 U	NA	2.2 U	2.3 U
Silver	0.73 U	0.86 U	0.09 J	0.11 J	NA	0.66 U	1 U	0.07 J	0.11 J	0.66 U	NA	0.25 J	0.65 U
Sodium	28.3 J	23.4 J	21.4 J	28.5 B	NA	16.2 J	19.1 J	24.3 J	26.2 B	20.7 B	NA	27.8 B	12.4 B
Thallium	1.8 U	2.1 U	2 U	2.3 U	NA	1.7 U	2.6 U	0.2 B	0.18 B	1.6 U	NA	1.6 U	1.6 U
Vanadium	10.8	19.4	23.3	22.1	NA	11.1	11.4	27.8	36.1	9	NA	22	7.8
Zinc	17.5 L	26.9 L	27 L	35 K	NA	20.3 L	12.1 L	5.2 L	8.5 L	10.8 K	NA	33.2	6.5
Wet Chemistry													
% Solids (pct)	73	89	90	92	87	92	85	85	84	77	83	89	94
pH (ph)	9.9	5.4	NA	7.1	NA	6.3	6.6	6.2	NA	6.8	NA	7.6	6
Total organic carbon (TOC) (ug/g)	18,000	14,000	NA	58,000	NA	4,700	10,000	3,200	NA	7,200	NA	12,000	8,700

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 1\[2_AOC1_SB_raw.xls], Victoria Brynildsen, 12/01/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB16-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1,1-Trichloroethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,1,2,2-Tetrachloroethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,1,2-Trichloroethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,1-Dichloroethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,1-Dichloroethene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,2,4-Trichlorobenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,2-Dibromo-3-chloropropane	12 R	10 R	13 R	12 R	12 R	12 R	13 U	13 U	14 U	14 U
1,2-Dibromoethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,2-Dichlorobenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,2-Dichloroethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,2-Dichloroethene (total)	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,2-Dichloropropane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,3-Dichlorobenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
1,4-Dichlorobenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
2-Butanone	12 U	10 U	13 U	12 U	12 U	12 U	13 U	8 J	9 J	14 U
2-Hexanone	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
4-Methyl-2-pentanone	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Acetone	2 B	18 B	12 B	12 U	9 B	6 B	13 U	48	41	14 U
Benzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Bromodichloromethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Bromoform	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Bromomethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Carbon disulfide	12 U	10 U	13 U	12 U	12 U	12 U	13 U	2 J	1 J	14 U
Carbon tetrachloride	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Chlorobenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Chloroethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Chloroform	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Chloromethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
cis-1,2-Dichloroethene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
cis-1,3-Dichloropropene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Cyclohexane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Dibromochloromethane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Dichlorodifluoromethane (Freon-12)	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Ethylbenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Isopropylbenzene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
m- and p-Xylene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Methyl acetate	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Methylcyclohexane	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Methylene chloride	8 B	6 B	5 B	5 B	9 B	3 B	3 B	4 B	3 B	3 B
Methyl-tert-butyl ether (MTBE)	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
o-Xylene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Styrene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Tetrachloroethene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Toluene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
trans-1,2-Dichloroethene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
trans-1,3-Dichloropropene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Trichloroethene	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Trichlorofluoromethane(Freon-11)	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Vinyl chloride	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Xylene, total	12 U	10 U	13 U	12 U	12 U	12 U	13 U	13 U	14 U	14 U
Semivolatile Organic Compounds (UG/KG)										
1,1-Biphenyl	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2,2'-Oxybis(1-chloropropane)	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2,4,5-Trichlorophenol	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
2,4,6-Trichlorophenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2,4-Dichlorophenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2,4-Dimethylphenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U

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Station ID	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB16-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name										
2,4-Dinitrophenol	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
2,4-Dinitrotoluene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Chloronaphthalene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2-Chlorophenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2-Methylnaphthalene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2-Methylphenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
2-Nitroaniline	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
2-Nitrophenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
3,3'-Dichlorobenzidine	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
3-Nitroaniline	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
4,6-Dinitro-2-methylphenol	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
4-Bromophenyl-phenylether	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
4-Chloro-3-methylphenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
4-Chloroaniline	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
4-Chlorophenyl-phenylether	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
4-Methylphenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
4-Nitroaniline	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
4-Nitrophenol	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
Acenaphthene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Acenaphthylene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Acetophenone	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Anthracene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Atrazine	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Benzaldehyde	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Benzo(a)anthracene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Benzo(a)pyrene	420 U	350 U	440 U	400 U	410 UJ	380 U	220 J	450 U	450 U	470 U
Benzo(b)fluoranthene	420 U	350 U	440 U	400 U	410 UJ	380 U	290 J	450 U	450 U	470 U
Benzo(g,h,i)perylene	420 U	350 U	440 U	400 U	410 UJ	380 U	350 J	450 U	450 U	470 U
Benzo(k)fluoranthene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
bis(2-Chloroethoxy)methane	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
bis(2-Chloroethyl)ether	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
bis(2-Ethylhexyl)phthalate	420 U	350 U	440 U	400 U	210 J	380 U	440 U	450 U	450 U	470 U
Butylbenzylphthalate	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Caprolactam	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Carbazole	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Chrysene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Dibenz(a,h)anthracene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Dibenzofuran	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Diethylphthalate	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Dimethyl phthalate	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Di-n-butylphthalate	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Di-n-octylphthalate	420 UJ	350 UJ	440 UJ	400 UJ	410 UJ	380 UJ	440 U	450 U	450 U	470 U
Fluoranthene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Fluorene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Hexachlorobenzene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Hexachlorobutadiene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Hexachlorocyclopentadiene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Hexachloroethane	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Indeno(1,2,3-cd)pyrene	420 U	350 U	440 U	400 U	410 UJ	380 U	270 J	450 U	450 U	470 U
Isophorone	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Naphthalene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
n-Nitroso-di-n-propylamine	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
n-Nitrosodiphenylamine	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Nitrobenzene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Pentachlorophenol	1,000 U	880 U	1,100 U	1,000 U	1,000 UJ	960 U	1,100 U	1,100 U	1,100 U	1,200 U
Phenanthrene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Phenol	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Pyrene	420 U	350 U	440 U	400 U	410 UJ	380 U	440 U	450 U	450 U	470 U
Pesticide/Polychlorinated Biphenyls (UG/KG)										

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Station ID	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB16-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name										
4,4'-DDD	3.8 U	3.5 U	0.27 J	4.3 U	4.3 U	3.9 U	0.48 J	4.3 U	4.5 U	4.2 U
4,4'-DDE	3.8 U	3.5 U	0.22 J	4.3 U	0.28 J	3.9 U	0.28 J	4.3 U	4.5 U	4.2 U
4,4'-DDT	3.8 U	3.5 U	0.48 J	4.3 U	4.3 U	3.9 U	0.45 J	4.3 U	4.5 U	4.2 U
Aldrin	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
alpha-BHC	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
alpha-Chlordane	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
Aroclor-1016	38 U	35 U	37 U	43 U	43 U	39 U	45 U	43 U	45 U	42 U
Aroclor-1221	76 U	70 U	75 U	87 U	85 U	78 U	90 U	87 U	91 U	83 U
Aroclor-1232	38 U	35 U	37 U	43 U	43 U	39 U	45 U	43 U	45 U	42 U
Aroclor-1242	38 U	35 U	37 U	43 U	43 U	39 U	45 U	43 U	45 U	42 U
Aroclor-1248	38 U	35 U	37 U	43 U	43 U	39 U	45 U	43 U	45 U	42 U
Aroclor-1254	38 U	35 U	37 U	43 U	43 U	39 U	45 U	43 U	45 U	42 U
Aroclor-1260	38 U	35 U	37 U	43 U	43 U	39 U	45 U	43 U	45 U	42 U
beta-BHC	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
delta-BHC	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
Dieldrin	3.8 U	3.5 U	3.7 U	4.3 U	4.3 U	3.9 U	4.5 U	4.3 U	4.5 U	4.2 U
Endosulfan I	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
Endosulfan II	3.8 U	3.5 U	3.7 U	4.3 U	4.3 U	3.9 U	4.5 U	4.3 U	4.5 U	4.2 U
Endosulfan sulfate	3.8 U	3.5 U	3.7 U	4.3 U	4.3 U	3.9 U	4.5 U	4.3 U	4.5 U	4.2 U
Endrin	3.8 U	3.5 U	3.7 U	4.3 U	4.3 U	3.9 U	4.5 U	4.3 U	4.5 U	4.2 U
Endrin aldehyde	3.8 U	3.5 U	3.7 U	4.3 U	4.3 U	3.9 U	4.5 U	4.3 U	4.5 U	4.2 U
Endrin ketone	3.8 U	3.5 U	3.7 U	4.3 U	4.3 U	3.9 U	4.5 U	4.3 U	4.5 U	4.2 U
gamma-BHC (Lindane)	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
gamma-Chlordane	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
Heptachlor	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
Heptachlor epoxide	1.9 U	1.8 U	1.9 U	2.2 U	2.1 U	1.9 U	2.3 U	2.2 U	2.3 U	2.1 U
Methoxychlor	19 U	18 U	19 U	22 U	21 U	19 U	23 U	22 U	23 U	21 U
Toxaphene	190 U	180 U	190 U	220 U	210 U	190 U	230 U	220 U	230 U	210 U
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,700 U	5,300 U	5,600 U	6,500 U	6,400 U	5,800 U	6,700 U	6,500 U	6,800 U	6,200 U
Nitroguanidine	250 U	250 U	250 U	250 U	250 U	250 U	120 U	130 U	130 U	130 UL
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)										
Aluminum	15,100	4,220	9,950	10,900	8,880	11,600	6,890	8,150	8,580	8,120
Antimony	0.32 L	4 UL	7.1 UL	0.49 L	46.1 L	0.14 L	1.7 L	0.21 L	0.32 L	0.37 L
Arsenic	5.8	1.5	2.6	3.9	17.4	6.6	5.2	14.1	6.7	7
Barium	25.7	20.5	40.2	41	52.6	15.4	61.6	19.1 J	21.4 J	32
Beryllium	0.49	0.29 J	0.59 J	0.58	0.49 J	0.53	0.41 J	0.2 J	0.22 J	0.34 J
Cadmium	0.72 U	0.03 B	0.04 B	0.15 J	4	0.69 U	0.45 J	0.34 J	0.3 J	0.2 J
Calcium	1,160	364	1,920	20,700	27,100	246 J	26,600 J	4,190 J	5,130 J	4,080 J
Chromium	22.8	4	8.2	14.5	27.6	21.8	13.5	10.4	11.5	9.3
Cobalt	3.7 J	1.3 J	2.5 J	3.2 J	7.3 J	4.3 J	3.2 J	4.7 J	3 J	2.9 J
Copper	7.7	1.4 J	9.1	12.6	105	3.6	61.5	3.9	6	20.8
Cyanide	0.6 U	0.5 U	0.6 U	0.6 U	0.3 J	0.55 U	0.65 UL	0.7 UL	0.6 UL	0.7 UL
Iron	28,500	2,250	5,140	16,300	43,300	28,900	16,700	9,790	10,200	11,600
Lead	93.7	5.7	14.4	38.6	3,360	10.2	283	9.6	11	19.5
Magnesium	700 J	170 J	568 J	1,460	1,450	691	1,160	783	348 J	423 J

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Station ID	CAA01-SO10	CAA01-SO12	CAA01-SO13	CAA01-SO14	CAA01-SO15	CAA01-SO16	CAA01-SO17	CAA01-SO18		CAA01-SO19
Sample ID	CAA01-SB10-1108	CAA01-SB12-1108	CAA01-SB13-1108	CAA01-SB14-1108	CAA01-SB15-1108	CAA01-SB16-1108	CAA01-SB17-1208	CAA01-SB18-1208	CAA01-SB18P-1208	CAA01-SB19-1208
Sample Date	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	11/07/08	12/18/08	12/18/08	12/18/08	12/17/08
Chemical Name										
Manganese	46.1	68.4	231	139	300	56.6	146	57.7	91.9	283
Mercury	0.12 U	0.05 B	0.06 B	0.11 U	0.11 U	0.04 B	0.14 UL	0.14 UL	0.14 UL	0.14 UL
Nickel	8.2	1.9 J	4.3 J	5.8	23	6.7	8.4	4.4 J	4.1 J	4.2 J
Potassium	836	126 J	307 J	824	495 J	918	364 J	344 J	398 J	413 J
Selenium	5 U	2.4 U	4.1 U	3.1 U	7.3 U	4.8 U	3.6 U	4.4 U	4.4 U	4 U
Silver	1.4 U	0.68 U	0.11 J	0.9 U	2.1 U	1.4 U	1 U	1.2 U	1.3 U	0.26 J
Sodium	25.7 B	10.2 B	25.4 B	46.7 B	59.2 B	19.1 B	41.5 J	23.1 B	31.5 J	42.5 J
Thallium	0.21 B	1.7 U	3 U	0.07 B	5.2 U	0.14 B	0.16 B	0.25 B	0.09 B	2.9 U
Vanadium	35.4	6.2	12.2	20.6	16.9	34.3	12.8	17.6	18.5	13.6
Zinc	21.6	5.2	19.5	30.4	1,130	21.8	120	352	165	92.8
Wet Chemistry										
% Solids (pct)	79	94	75	82	80	86	74	77	73	80
pH (ph)	6.9	7.6	7.4	6.7	7.8	5.5	8.2	7.6	7.3	7.8
Total organic carbon (TOC) (ug/g)	4,600	5,800	10,000	3,300	32,000	8,000	43,000	16,000	7,600	18,000

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Groundwater Data Raw Analytical Results
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Station ID	CAA01-DW01	CAA01-DW02	CAA01-DW03	CAA01-DW04		CAA01-DW05		CAA01-DW06	CAA01-DW07
Sample ID	CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108	CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208	CAA01-DW06-1208	CAA01-DW07-1208
Sample Date	11/03/08	11/03/08	11/04/08	11/05/08	11/05/08	12/18/08	12/18/08	12/18/08	12/19/08
Chemical Name									
Volatile Organic Compounds (UG/L)									
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2-Dibromo-3-chloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2-Dibromoethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Acetone	10 U	3 B	3 J	2 J	2 J	4 B	4 B	3 B	2 B
Benzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Carbon tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
m- and p-Xylene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Methyl acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Methylene chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
o-Xylene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Vinyl chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ
Semivolatile Organic Compounds (UG/L)									
1,1-Biphenyl	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2,2'-Oxybis(1-chloropropane)	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2,4,5-Trichlorophenol	24 U	25 U	26 U	25 U	24 U	24 U	24 U	24 U	26 U
2,4,6-Trichlorophenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2,4-Dichlorophenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2,4-Dimethylphenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U

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Station ID	CAA01-DW01	CAA01-DW02	CAA01-DW03	CAA01-DW04		CAA01-DW05		CAA01-DW06	CAA01-DW07
Sample ID	CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108	CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208	CAA01-DW06-1208	CAA01-DW07-1208
Sample Date	11/03/08	11/03/08	11/04/08	11/05/08	11/05/08	12/18/08	12/18/08	12/18/08	12/19/08
Chemical Name									
2,4-Dinitrophenol	24 U	25 U	26 U	25 U	24 U	24 U	24 U	24 U	26 U
2,4-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
2,6-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
2-Chloronaphthalene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2-Chlorophenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2-Methylnaphthalene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	7 J	10 U
2-Methylphenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
2-Nitroaniline	24 U	25 U	26 U	25 U	24 U	24 U	24 U	24 U	26 U
2-Nitrophenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
3,3'-Dichlorobenzidine	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
3-Nitroaniline	24 U	25 U	26 U	25 U	24 U	24 U	24 U	24 U	26 U
4,6-Dinitro-2-methylphenol	24 U	25 U	26 U	25 U	24 U	24 U	24 U	24 U	26 U
4-Bromophenyl-phenylether	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
4-Chloro-3-methylphenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
4-Chloroaniline	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
4-Chlorophenyl-phenylether	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
4-Methylphenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
4-Nitroaniline	24 U	25 U	26 UJ	25 UJ	24 UJ	24 U	24 U	24 U	26 U
4-Nitrophenol	24 R	25 R	26 R	25 R	24 R	24 U	24 U	24 U	26 U
Acenaphthene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Acenaphthylene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Acetophenone	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Anthracene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Atrazine	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Benzaldehyde	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Benzo(a)anthracene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Benzo(a)pyrene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Benzo(b)fluoranthene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Benzo(g,h,i)perylene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Benzo(k)fluoranthene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
bis(2-Chloroethoxy)methane	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
bis(2-Chloroethyl)ether	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
bis(2-Ethylhexyl)phthalate	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Butylbenzylphthalate	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Caprolactam	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Carbazole	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Chrysene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Dibenz(a,h)anthracene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Dibenzofuran	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Diethylphthalate	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Dimethyl phthalate	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Di-n-butylphthalate	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Di-n-octylphthalate	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Fluoranthene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Fluorene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Hexachlorobenzene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Hexachlorobutadiene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Hexachlorocyclopentadiene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Hexachloroethane	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Indeno(1,2,3-cd)pyrene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Isophorone	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Naphthalene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
n-Nitroso-di-n-propylamine	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
n-Nitrosodiphenylamine	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Nitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
Pentachlorophenol	24 U	25 U	26 U	25 U	24 U	24 U	24 U	24 U	26 U
Phenanthrene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Phenol	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Pyrene	9 U	10 U	10 U	10 U	9 U	9 U	10 U	9 U	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)									

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Station ID	CAA01-DW01	CAA01-DW02	CAA01-DW03	CAA01-DW04		CAA01-DW05		CAA01-DW06	CAA01-DW07
Sample ID	CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108	CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208	CAA01-DW06-1208	CAA01-DW07-1208
Sample Date	11/03/08	11/03/08	11/04/08	11/05/08	11/05/08	12/18/08	12/18/08	12/18/08	12/19/08
Chemical Name									
4,4'-DDD	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
4,4'-DDE	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
4,4'-DDT	0.1 U	0.11 U	0.11 U	0.1 UJ	0.1 UJ	0.11 U	0.11 U	0.13 U	0.1 U
Aldrin	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
alpha-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
alpha-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
Aroclor-1016	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.3 U	1 U
Aroclor-1221	2 U	2.1 U	2.1 U	2 U	2 U	2.2 U	2.2 U	2.7 U	2 U
Aroclor-1232	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.3 U	1 U
Aroclor-1242	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.3 U	1 U
Aroclor-1248	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.3 U	1 U
Aroclor-1254	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.3 U	1 U
Aroclor-1260	1 U	1.1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.3 U	1 U
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
Dieldrin	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
Endosulfan I	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
Endosulfan II	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
Endosulfan sulfate	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
Endrin	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
Endrin aldehyde	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
Endrin ketone	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	0.11 U	0.11 U	0.13 U	0.1 U
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 UL	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 UL
gamma-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
Heptachlor	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
Heptachlor epoxide	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U	0.06 U	0.06 U	0.07 U	0.05 U
Methoxychlor	0.5 UJ	0.53 UJ	0.53 UJ	0.5 U	0.5 U	0.56 U	0.56 U	0.67 U	0.5 U
Toxaphene	5 U	5.3 U	5.3 U	5 U	5 U	5.6 U	5.6 U	6.7 U	5 U
Explosives (UG/L)									
1,3,5-Trinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
1,3-Dinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
2,4,6-Trinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
2-Amino-4,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
2-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 U
3,5-Dinitroaniline	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
3-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 U
4-Amino-2,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.25 U
4-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 U
HMX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 UL	0.4 UL	0.4 UL	0.5 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PETN	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.3 U
RDX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 U
Tetryl	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.5 U
Total Metals (UG/L)									
Aluminum	11,200	3,420	142,000	102,000	114,000	1,280	1,000	1,440	147 J
Antimony	2.9 J	3.2 J	13.3 L	60 R	60 R	1 J	1.1 J	1.7 J	60 U
Arsenic	61.7 B	18.4	731	45.2	46.6	12.1 B	11.4 B	4.2 B	10.5 B
Barium	91.4 J	73.1 J	931	337	365	104 J	101 J	33.9 J	59.4 J
Beryllium	0.8 J	0.23 J	11.7	2.3 J	2.6 J	5 U	5 U	5 U	5 U
Cadmium	0.38 B	0.21 B	1.7 J	1.7 J	1.5 J	0.13 B	0.08 B	0.07 B	0.07 B
Calcium	193,000	195,000	1,650,000	138,000	137,000	180,000	178,000	103,000	126,000
Chromium	61.5	21.8 B	1,050	127	139	2 J	1.6 J	10 U	0.58 J
Cobalt	7.3 J	2.8 J	90.5 J	15.8 J	16.8 J	0.3 B	0.39 B	0.43 B	0.87 B
Copper	14.8 J	11.1 B	170	43.4	49.2	8.8 J	10.3 J	3.4 J	1.1 J
Cyanide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron	29,200	8,440	449,000	104,000	111,000	18,000	17,700	21.6 B	2,720
Lead	11.2	3.7 B	130	82.7	93.8	3.9 J	3.8 J	1.1 J	1.5 J
Magnesium	4,900 J	7,380	50,500	10,700	11,100	7,080	6,920	1,860 J	3,470 J

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Sample ID	CAA01-DW01-1108	CAA01-DW02-1108	CAA01-DW03-1108	CAA01-DW04-1108	CAA01-DW04P-1108	CAA01-DW05-1208	CAA01-DW05P-1208	CAA01-DW06-1208	CAA01-DW07-1208
Sample Date	11/03/08	11/03/08	11/04/08	11/05/08	11/05/08	12/18/08	12/18/08	12/18/08	12/19/08
Chemical Name									
Manganese	162	143	2,600	791	805	778	769	6.2 J	320
Mercury	0.2 U	0.2 U	0.2 U	0.18 J	0.15 J	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel	20.2 B	14 B	323	56.7	61.1	1 J	0.9 J	2.8 J	0.45 J
Potassium	3,870 J	5,430	39,200	6,590	6,680	2,670 J	2,550 J	3,310 J	1,650 J
Selenium	6.9 B	35 U	64.4 J	35 U	1 J	35 U	35 U	35 U	35 U
Silver	0.44 J	10 U	20 U	0.5 B	0.4 B	10 U	10 U	10 U	10 U
Sodium	6,890	8,000	23,000	8,010	7,660	8,680	8,650	7,060	5,790
Thallium	2.4 B	2.8 B	7 B	25 U	25 U	4.3 B	4.2 B	3 B	4.1 B
Vanadium	60.3	18.2 J	821	164	175	1.9 J	1.1 J	1.4 J	50 U
Zinc	62.6	22.7 B	758	205	215	13.3 J	9.6 J	3.1 J	3.4 J
Dissolved Metals (UG/L)									
Aluminum, Dissolved	723	187 J	384	167 J	178 J	73.2 B	68.4 B	513	134 J
Antimony, Dissolved	1.1 J	1.1 J	60 U	60 U	60 U	60 U	0.88 J	2.5 J	60 U
Arsenic, Dissolved	6.5 B	3.3 B	4.3 J	25.4	25	10.6	9.2 B	4.3 B	9.2 B
Barium, Dissolved	43.4 J	61.9 J	54.4 J	87.5 J	85 J	94.7 J	92.3 J	192 J	54.2 J
Beryllium, Dissolved	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Cadmium, Dissolved	0.12 B	0.13 B	0.12 B	0.52 B	0.5 B	5 U	0.05 B	5 U	0.05 B
Calcium, Dissolved	144,000	183,000	167,000	141,000	140,000	175,000	175,000	474,000	138,000
Chromium, Dissolved	3.7 J	0.82 J	2.4 J	10 U	10 U	10 U	0.42 J	0.58 J	0.48 J
Cobalt, Dissolved	1.5 J	1.4 J	3 J	0.52 J	0.32 J	50 U	0.29 B	0.25 B	0.32 B
Copper, Dissolved	2.8 B	2.1 B	2.5 B	1 B	1.3 B	1.4 J	2 J	6.4 J	25 U
Iron, Dissolved	1,760	261	4,150	49,100	48,600	16,300	14,000	100 U	3,500
Lead, Dissolved	2.5 B	1.8 B	1.8 J	2.2 B	1.7 J	1 J	10 U	2.9 J	1.2 J
Magnesium, Dissolved	2,200 J	6,800	2,480 J	6,940	6,840	6,760	6,730	10.7 J	3,510 J
Manganese, Dissolved	67.8	99.2	228	685	680	749	749	15 U	306
Mercury, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel, Dissolved	5.8 B	5.8 B	19.6 J	13.6 J	12.4 J	40 U	0.53 J	10.6 J	0.71 J
Potassium, Dissolved	1,140 J	4,720 J	1,410 J	3,200 J	3,080 J	2,510 J	2,500 J	8,120	1,500 J
Selenium, Dissolved	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U
Silver, Dissolved	10 U	10 U	10 U	0.43 B	10 U	10 U	0.34 J	10 U	10 U
Sodium, Dissolved	6,340	7,940	8,300	8,080	7,880	8,490	8,440	14,000	6,240
Thallium, Dissolved	2.4 B	2.3 B	3.4 B	2.4 B	2.9 B	4 B	4.4 B	5.3 B	25 U
Vanadium, Dissolved	2.9 J	0.42 B	1.3 J	0.54 J	0.6 J	50 U	50 U	0.58 J	0.44 J
Zinc, Dissolved	12.9 B	5 B	22.8 J	82.6	78	2.7 J	2.8 J	2.3 J	2.9 J

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 1\[3_AOC1_GW_raw.xls], Victoria Brynildsen, 12/01/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

AOC 2

Cheatham Annex
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Surface Soil Data Raw Analytical Results
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Station ID	CAA002-A2DPB01	CAA002-A2DPB02	CAA002-A2DPB03	CAA002-A2DPB04	CAA002-A2HA01		CAA002-A2HA02
Sample ID	CAA02-A2-DPB01-00-1098	CAA02-A2-DPB02-00-1098	CAA02-A2-DPB03-00-1098	CAA02-A2-DPB04-00-1098	CAA02-A2-HA01-00-1098	CAA02-A2-HA01-00D-1098	CAA02-A2-HA02-00-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name							
Volatile Organic Compounds (UG/KG)							
1,1,1-Trichloroethane	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
1,1,2,2-Tetrachloroethane	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
1,1,2-Trichloroethane	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
1,1-Dichloroethane	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
1,1-Dichloroethene	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
1,2,4-Trichlorobenzene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
1,2-Dichlorobenzene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
1,2-Dichloroethane	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
1,2-Dichloroethene (total)	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
1,2-Dichloropropane	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
1,3-Dichlorobenzene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
1,4-Dichlorobenzene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2-Butanone	13 U	14 U	14 UJ	12 U	12 UJ	12 U	15 U
2-Hexanone	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
4-Methyl-2-pentanone	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Acetone	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Benzene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Bromodichloromethane	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Bromoform	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Bromomethane	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Carbon disulfide	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Carbon tetrachloride	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Chlorobenzene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Chloroethane	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Chloroform	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Chloromethane	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
cis-1,3-Dichloropropene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Dibromochloromethane	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Ethylbenzene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Methylene chloride	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Styrene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Tetrachloroethene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Toluene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
trans-1,3-Dichloropropene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Trichloroethene	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Vinyl chloride	13 U	14 U	14 UJ	12 U	12 U	12 U	15 U
Xylene, total	13 U	14 U	14 UJ	12 U	12 UJ	12 UJ	15 U
Semivolatile Organic Compounds (UG/KG)							
2,2'-Oxybis(1-chloropropane)	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2,4,5-Trichlorophenol	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
2,4,6-Trichlorophenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2,4-Dichlorophenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2,4-Dimethylphenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2,4-Dinitrophenol	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
2,4-Dinitrotoluene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2,6-Dinitrotoluene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2-Chloronaphthalene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2-Chlorophenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2-Methylnaphthalene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2-Methylphenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
2-Nitroaniline	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
2-Nitrophenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
3,3'-Dichlorobenzidine	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
3-Nitroaniline	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
4,6-Dinitro-2-methylphenol	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
4-Bromophenyl-phenylether	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
4-Chloro-3-methylphenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
4-Chloroaniline	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ

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Station ID	CAA002-A2DPB01	CAA002-A2DPB02	CAA002-A2DPB03	CAA002-A2DPB04	CAA002-A2HA01		CAA002-A2HA02
Sample ID	CAA02-A2-DPB01-00-1098	CAA02-A2-DPB02-00-1098	CAA02-A2-DPB03-00-1098	CAA02-A2-DPB04-00-1098	CAA02-A2-HA01-00-1098	CAA02-A2-HA01-00D-1098	CAA02-A2-HA02-00-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name							
4-Chlorophenyl-phenylether	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
4-Methylphenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
4-Nitroaniline	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
4-Nitrophenol	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
Acenaphthene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Acenaphthylene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Anthracene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Benzo(a)anthracene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Benzo(a)pyrene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Benzo(b)fluoranthene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Benzo(g,h,i)perylene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Benzo(k)fluoranthene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
bis(2-Chloroethoxy)methane	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
bis(2-Chloroethyl)ether	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
bis(2-Ethylhexyl)phthalate	43 BJ	480 UJ	79 BJ	390 UJ	54 BJ	42 BJ	78 BJ
Butylbenzylphthalate	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Carbazole	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Chrysene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Dibenz(a,h)anthracene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Dibenzofuran	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Diethylphthalate	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Dimethyl phthalate	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Di-n-butylphthalate	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Di-n-octylphthalate	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Fluoranthene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Fluorene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Hexachlorobenzene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Hexachlorobutadiene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Hexachlorocyclopentadiene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Hexachloroethane	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Indeno(1,2,3-cd)pyrene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Isophorone	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Naphthalene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
n-Nitroso-di-n-propylamine	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
n-Nitrosodiphenylamine	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Nitrobenzene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
Pentachlorophenol	1,100 UJ	1,200 UJ	1,200 UJ	980 UJ	1,000 UJ	1,000 UJ	1,300 UJ
Phenanthrene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Phenol	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Pyrene	420 UJ	480 UJ	470 UJ	390 UJ	410 UJ	410 UJ	510 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)							
4,4'-DDD	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ
4,4'-DDE	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	520 J
4,4'-DDT	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	640 J
Aldrin	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
alpha-BHC	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
alpha-Chlordane	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
Aroclor-1016	42 UJ	48 UJ	47 UJ	39 UJ	41 UJ	41 UJ	510 UJ
Aroclor-1221	84 UJ	95 UJ	94 UJ	78 UJ	81 UJ	81 UJ	1,000 UJ
Aroclor-1232	42 UJ	48 UJ	47 UJ	39 UJ	41 UJ	41 UJ	510 UJ
Aroclor-1242	42 UJ	48 UJ	47 UJ	39 UJ	41 UJ	41 UJ	510 UJ
Aroclor-1248	42 UJ	48 UJ	47 UJ	39 UJ	41 UJ	41 UJ	510 UJ
Aroclor-1254	42 UJ	48 UJ	47 UJ	39 UJ	41 UJ	41 UJ	510 UJ
Aroclor-1260	42 UJ	48 UJ	47 UJ	39 UJ	41 UJ	41 UJ	510 UJ
beta-BHC	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
delta-BHC	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
Dieldrin	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ
Endosulfan I	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
Endosulfan II	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ
Endosulfan sulfate	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ

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Station ID	CAA002-A2DPB01	CAA002-A2DPB02	CAA002-A2DPB03	CAA002-A2DPB04	CAA002-A2HA01		CAA002-A2HA02
Sample ID	CAA02-A2-DPB01-00-1098	CAA02-A2-DPB02-00-1098	CAA02-A2-DPB03-00-1098	CAA02-A2-DPB04-00-1098	CAA02-A2-HA01-00-1098	CAA02-A2-HA01-00D-1098	CAA02-A2-HA02-00-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name							
Endrin	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ
Endrin aldehyde	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ
Endrin ketone	4.2 UJ	4.8 UJ	4.7 UJ	3.9 UJ	4.1 UJ	4.1 UJ	51 UJ
gamma-BHC (Lindane)	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
gamma-Chlordane	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
Heptachlor	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	2 UJ	25 UJ
Heptachlor epoxide	2.1 UJ	2.4 UJ	2.3 UJ	2 UJ	2 UJ	4 J	25 UJ
Methoxychlor	21 UJ	24 UJ	23 UJ	20 UJ	20 UJ	20 UJ	250 UJ
Toxaphene	210 UJ	240 UJ	230 UJ	200 UJ	200 UJ	200 UJ	2,500 UJ
Explosives (UG/KG)							
1,3,5-Trinitrobenzene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
1,3-Dinitrobenzene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
2,4,6-Trinitrotoluene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
2-Amino-4,6-dinitrotoluene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
2-Nitrotoluene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
3-Nitrotoluene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
4-Amino-2,6-dinitrotoluene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
4-Nitrotoluene	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
HMX	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
Nitroglycerin	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
RDX	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
Tetryl	1,300 U	1,400 U	1,400 U	1,200 U	1,200 U	1,200 U	1,500 U
Total Metals (MG/KG)							
Aluminum	1,890	5,710	8,500	5,650	6,020	7,300	6,170
Antimony	0.58 UL	0.68 UL	0.63 UL	0.55 UL	0.56 UL	0.74 L	0.72 UL
Arsenic	3	3.5	20	5.5	11.1	14	6.6
Barium	18.4 J	36.5 J	38.7 J	48.6	64.5	77.2	47.2 J
Beryllium	0.14 J	0.2 J	0.77 J	0.43 J	0.55 J	0.64 J	0.43 J
Cadmium	0.05 U	0.06 U	0.05 U	0.05 U	0.14 B	0.05 U	0.19 B
Calcium	989	1,720	2,700	2,840	3,190	2,670	3,070
Chromium	3.9	12.5	29.4	11.5	24.6	39	15.3
Cobalt	1.5 U	2.4 J	6.1 J	2.8 J	4.1 J	5.6 J	4.2 J
Copper	2.2 J	2.4 J	7.8	4	20.2	20.5	6.2
Cyanide	0.25 U	0.29 U	0.27 U	0.24 U	0.25 U	0.25 U	0.31 U
Iron	3,180	13,800	44,000	15,000	22,700	28,600	14,800
Lead	13.3	8	29.3	20	57.1	104	89.9
Magnesium	269	384	1,050	553	795	906	697
Manganese	62.7	152	169	170	240	238	176
Mercury	1.8	1.4	1.2 J	1.3	0.11 B	0.13 B	0.96 J
Nickel	2.3 U	4 J	12.1	5.6 J	10.6	12.5	6.9 J
Potassium	204 J	455	1,320	547	708	871	710
Selenium	0.53 U	0.63 U	0.64 K	0.71 K	0.51 U	0.53 U	0.66 U
Silver	0.24 U	0.28 U	0.26 U	0.23 U	0.23 U	0.24 U	0.3 U
Sodium	106 J	138 J	130 J	134 J	133 J	127 J	158 J
Thallium	0.28 U	0.32 U	0.31 U	0.26 U	0.27 U	0.28 U	0.33 U
Vanadium	6 J	25.4	42.3	20.5	24.8	30.2	18.7
Zinc	9.5	21.3	55.9	22.8	49.9	53.6	96.9

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BJ - See 'B' and 'J'

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

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Station ID	CAA002-A2DPB01	CAA002-A2DPB02	CAA002-A2DPB03	CAA002-A2DPB04	CAA002-A2HA01		CAA002-A2HA02
Sample ID	CAA02-A2-DPB01-00-1098	CAA02-A2-DPB02-00-1098	CAA02-A2-DPB03-00-1098	CAA02-A2-DPB04-00-1098	CAA02-A2-HA01-00-1098	CAA02-A2-HA01-00D-1098	CAA02-A2-HA02-00-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name							

U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram
UG/KG - Micrograms per kilogram

Cheatham Annex
AOC 2
Subsurface Soil Data Raw Analytical Results
December 2010

Station ID	CAA02-A2DPB01		CAA02-A2DPB02		CAA02-A2DPB03		CAA02-A2DPB04		CAA02-A2HA01		CAA02-A2HA02
Sample ID	CAA02-A2-DPB01-15-1098	CAA02-A2-DPB01-03-1098	CAA02-A2-DPB02-10-1098	CAA02-A2-DPB02-03-1098	CAA02-A2-DPB03-09-1098	CAA02-A2-DPB03-03-1098	CAA02-A2-DPB04-09-1098	CAA02-A2-DPB04-03-1098	CAA02-A2-HA01-02-1098	CAA02-A2-HA01-02D-1098	CAA02-A2-HA02-01-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/23/98	10/23/98	10/22/98	10/22/98	10/22/98
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
1,1,2,2-Tetrachloroethane	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
1,1,2-Trichloroethane	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
1,1-Dichloroethane	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
1,1-Dichloroethene	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
1,2,4-Trichlorobenzene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
1,2-Dichlorobenzene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
1,2-Dichloroethane	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
1,2-Dichloroethene (total)	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
1,2-Dichloropropane	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
1,3-Dichlorobenzene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
1,4-Dichlorobenzene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2-Butanone	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
2-Hexanone	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
4-Methyl-2-pentanone	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Acetone	14 U	66	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Benzene	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Bromodichloromethane	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Bromoform	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Bromomethane	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Carbon disulfide	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Carbon tetrachloride	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Chlorobenzene	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Chloroethane	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Chloroform	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Chloromethane	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
cis-1,3-Dichloropropene	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Dibromochloromethane	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Ethylbenzene	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Methylene chloride	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Styrene	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Tetrachloroethene	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Toluene	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
trans-1,3-Dichloropropene	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Trichloroethene	14 U	14 U	13 U	14 UL	13 U	11 UJ	13 U	11 U	14 U	15 U	11 U
Vinyl chloride	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Xylene, total	14 U	14 U	13 U	14 UL	13 U	11 U	13 U	11 U	14 U	15 U	11 U
Semivolatile Organic Compounds (UG/KG)											
2,2'-Oxybis(1-chloropropane)	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2,4,5-Trichlorophenol	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
2,4,6-Trichlorophenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2,4-Dichlorophenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2,4-Dimethylphenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2,4-Dinitrophenol	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
2,4-Dinitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
2,6-Dinitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
2-Chloronaphthalene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2-Chlorophenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2-Methylnaphthalene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2-Methylphenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
2-Nitroaniline	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
2-Nitrophenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
3,3'-Dichlorobenzidine	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
3-Nitroaniline	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
4,6-Dinitro-2-methylphenol	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
4-Bromophenyl-phenylether	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
4-Chloro-3-methylphenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
4-Chloroaniline	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
4-Chlorophenyl-phenylether	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
4-Methylphenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
4-Nitroaniline	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
4-Nitrophenol	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
Acenaphthene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Acenaphthylene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Anthracene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Benzo(a)anthracene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Benzo(a)pyrene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Benzo(b)fluoranthene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Benzo(g,h,i)perylene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Benzo(k)fluoranthene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ

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Station ID	CAA02-A2DPB01		CAA02-A2DPB02		CAA02-A2DPB03		CAA02-A2DPB04		CAA02-A2HA01		CAA02-A2HA02
Sample ID	CAA02-A2-DPB01-15-1098	CAA02-A2-DPB01-03-1098	CAA02-A2-DPB02-10-1098	CAA02-A2-DPB02-03-1098	CAA02-A2-DPB03-09-1098	CAA02-A2-DPB03-03-1098	CAA02-A2-DPB04-09-1098	CAA02-A2-DPB04-03-1098	CAA02-A2-HA01-02-1098	CAA02-A2-HA01-02D-1098	CAA02-A2-HA02-01-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/23/98	10/23/98	10/22/98	10/22/98	10/22/98
Chemical Name											
bis(2-Chloroethoxy)methane	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
bis(2-Chloroethyl)ether	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
bis(2-Ethylhexyl)phthalate	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	53 BJ	41 BJ
Butylbenzylphthalate	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Carbazole	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Chrysene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Dibenz(a,h)anthracene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Dibenzofuran	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Diethylphthalate	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Dimethyl phthalate	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Di-n-butylphthalate	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Di-n-octylphthalate	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Fluoranthene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Fluorene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Hexachlorobenzene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Hexachlorobutadiene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Hexachlorocyclopentadiene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Hexachloroethane	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Indeno(1,2,3-cd)pyrene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Isophorone	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Naphthalene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
n-Nitroso-di-n-propylamine	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
n-Nitrosodiphenylamine	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Nitrobenzene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
Pentachlorophenol	1,200 R	1,200 UJ	1,100 UJ	1,200 R	1,100 UJ	940 UJ	1,100 UJ	930 UL	1,200 UJ	1,200 UJ	920 UJ
Phenanthrene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Phenol	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Pyrene	460 R	480 UJ	440 UJ	470 R	420 UJ	370 UJ	430 UJ	370 UL	460 UJ	490 UJ	370 UJ
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
4,4'-DDE	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	120 J
4,4'-DDT	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	51 J
Aldrin	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
alpha-BHC	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
alpha-Chlordane	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
Aroclor-1016	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
Aroclor-1221	93 UJ	95 UJ	88 UJ	94 UJ	84 UJ	75 UJ	87 UJ	74 UJ	93 UJ	98 UJ	73 UJ
Aroclor-1232	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
Aroclor-1242	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
Aroclor-1248	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
Aroclor-1254	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
Aroclor-1260	46 UJ	48 UJ	44 UJ	47 UJ	42 UJ	37 UJ	43 UJ	37 UJ	46 UJ	49 UJ	37 UJ
beta-BHC	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
delta-BHC	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
Dieldrin	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
Endosulfan I	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
Endosulfan II	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
Endosulfan sulfate	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
Endrin	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
Endrin aldehyde	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
Endrin ketone	4.6 UJ	4.8 UJ	4.4 UJ	4.7 UJ	4.2 UJ	3.7 UJ	4.3 UJ	3.7 UJ	4.6 UJ	4.9 UJ	3.7 UJ
gamma-BHC (Lindane)	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
gamma-Chlordane	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
Heptachlor	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
Heptachlor epoxide	2.3 UJ	2.4 UJ	2.2 UJ	2.3 UJ	2.1 UJ	1.9 UJ	2.2 UJ	1.9 UJ	2.3 UJ	2.5 UJ	1.8 UJ
Methoxychlor	23 UJ	24 UJ	22 UJ	23 UJ	21 UJ	19 UJ	22 UJ	19 UJ	23 UJ	25 UJ	18 UJ
Toxaphene	230 UJ	240 UJ	220 UJ	230 UJ	210 UJ	190 UJ	220 UJ	190 UJ	230 UJ	250 UJ	180 UJ
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
1,3-Dinitrobenzene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
2,4,6-Trinitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
2-Amino-4,6-dinitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
2-Nitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
3-Nitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
4-Amino-2,6-dinitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
4-Nitrotoluene	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
HMX	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
PETN	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
RDX	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U
Tetryl	1,400 U	1,400 U	1,300 U	1,400 U	1,300 U	1,100 U	1,300 U	1,100 U	1,400 U	1,500 U	1,100 U

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Station ID	CAA02-A2DPB01		CAA02-A2DPB02		CAA02-A2DPB03		CAA02-A2DPB04		CAA02-A2HA01		CAA02-A2HA02
Sample ID	CAA02-A2-DPB01-15-1098	CAA02-A2-DPB01-03-1098	CAA02-A2-DPB02-10-1098	CAA02-A2-DPB02-03-1098	CAA02-A2-DPB03-09-1098	CAA02-A2-DPB03-03-1098	CAA02-A2-DPB04-09-1098	CAA02-A2-DPB04-03-1098	CAA02-A2-HA01-02-1098	CAA02-A2-HA01-02D-1098	CAA02-A2-HA02-01-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98	10/23/98	10/23/98	10/22/98	10/22/98	10/22/98
Chemical Name											
Total Metals (MG/KG)											
Aluminum	5,210	5,390	2,370	5,630	2,910	6,680	4,330	8,030	12,500	11,000	6,450
Antimony	0.71 L	0.65 UL	0.62 L	1.3 L	0.66 L	0.55 L	0.64 L	0.5 UL	1 L	0.96 L	0.5 UL
Arsenic	9.2	7.6	10.6	24.7	9.3	17.4	7.2	2.7	30.8	31.1	4.9
Barium	38.3 J	9 J	19.2 J	22.4 J	19.5 J	15.3 J	29.8 J	12.1 J	33.5 J	32.5 J	35.3 J
Beryllium	0.46 J	0.48 J	0.31 J	0.7 J	0.46 J	0.7 J	0.6 J	0.25 J	0.96 J	0.85 J	0.36 J
Cadmium	0.33 J	0.05 U	0.29 J	0.29 J	0.29 J	0.11 B	0.37 J	0.04 U	0.34 J	0.3 J	0.06 B
Calcium	156,000	499	152,000	2,580	229,000	309	67,000	1,010	1,690	1,720	1,290
Chromium	19.2	20.4	12.2	22.2	13.2	21.6	19.2	27.5	43.2	40.7	12.4
Cobalt	5.5 J	1.7 U	2.3 J	10.1 J	2.5 J	5.3 J	4.6 J	3.5 J	7 J	6.5 J	3.7 J
Copper	6.2	1.8 J	3.1	2.5 J	2.8	1.6 J	1 U	2 J	4.2	3.7	4.7
Cyanide	0.27 U	0.3 U	0.27 U	0.29 U	0.24 U	0.23 U	0.27 U	0.22 U	0.29 U	0.31 U	0.3 U
Iron	18,500	9,590	13,800	29,400	21,600	24,100	45,300	11,000	42,000	38,400	14,700
Lead	6.1	8.5	2.8	6.4	2.1	5.2	3.8	3.7	11.3	9.8	18.9
Magnesium	2,620	432	2,220	566	3,390	1,320	2,860	1,180	1,510	1,220	462
Manganese	97	7.1	43.1	75.9	46	54	134	12.6	79.5	74.6	99.9
Mercury	0.61 U	1.2	0.08 B	0.63 J	0.95 J	0.56 J	0.69 J	0.94 J	0.08 B	0.89 J	1
Nickel	10.8	2.6 U	5 J	15.3	4.8 J	9.8	6.5 J	4.5 J	21.8	21.2	6.6 J
Potassium	2,080	594	2,080	386	4,720	1,450	4,520	1,100	1,900	1,320	474
Selenium	0.56 U	0.6 U	0.54 U	0.6 U	0.56 U	0.47 U	0.55 U	0.46 U	0.68 K	0.63 U	0.46 U
Silver	0.25 U	0.27 U	0.25 U	0.27 U	0.25 U	0.21 U	0.25 U	0.21 U	0.27 U	0.29 U	0.21 U
Sodium	1,460	132 J	974	141 J	1,240	106 J	252	102 J	136 J	155 J	109 J
Thallium	0.32 U	0.32 U	0.3 U	0.32 U	0.3 U	0.25 U	0.29 UL	0.26 U	0.32 U	0.33 U	0.24 U
Vanadium	14.6	54.4	8.2 J	26.2	9.4 J	19.9	14.8	32.7	39.8	34.9	18.6
Zinc	37	7.3	21.4	45.8	19	32.7	32.1	17.9	49.9	47.4	49.8

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 2\[2_AOC2_SB_raw.xls], Victoria Brynildsen, 12/01/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BJ - See 'B' and 'J'

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

Cheatham Annex
AOC 2
Subsurface Soil Data Raw Analytical Results
December 2010

Station ID	CAA02-A2TP01F			CAA02-A2TP01N	CAA02-A2TP02F	CAA02-A2TP02N	CAA02-A2TP03F	CAA02-A2TP03N	CAA02-A2TP04F	CAA02-A2TP04N	CAA02-A2TP05F
Sample ID	CAA02-A2-TP01-F1-1199	CAA02-A2-TP01-F-1199	CAA02-A2-TP01-FD-1199	CAA02-A2-TP01-N-1199	CAA02-A2-TP02-F-1199	CAA02-A2-TP02-N-1199	CAA02-A2-TP03-F-1199	CAA02-A2-TP03-N-1199	CAA02-A2-TP04-F-1199	CAA02-A2-TP04-N-1199	CAA02-A2-TP05-F-1199
Sample Date	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,1,2,2-Tetrachloroethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,1,2-Trichloroethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,1-Dichloroethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,1-Dichloroethene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,2,4-Trichlorobenzene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
1,2-Dichlorobenzene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
1,2-Dichloroethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,2-Dichloroethene (total)	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,2-Dichloropropane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
1,3-Dichlorobenzene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
1,4-Dichlorobenzene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2-Butanone	NA	14.1 U	4 B	7 B	11.9 U	10 UL	5 B	5 B	11.8 U	4 B	12.2 UL
2-Hexanone	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
4-Methyl-2-pentanone	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Acetone	NA	35 B	12.2 U	9 B	5 B	14 B	17 B	6 B	17 B	6 B	12.2 UL
Benzene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Bromodichloromethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Bromoform	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Bromomethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Carbon disulfide	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Carbon tetrachloride	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Chlorobenzene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Chloroethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Chloroform	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Chloromethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
cis-1,3-Dichloropropene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Dibromochloromethane	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Ethylbenzene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	10 J
Methylene chloride	NA	12 B	5 B	6 B	13 B	37 B	7 B	9 B	8 B	9 B	28 B
Styrene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Tetrachloroethene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Toluene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
trans-1,3-Dichloropropene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Trichloroethene	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Vinyl chloride	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	12.2 U	12.2 UL
Xylene, total	NA	14.1 U	12.2 U	12.4 U	11.9 U	10 UL	11.5 U	12.6 U	11.8 U	1 J	12.2 UL
Semivolatile Organic Compounds (UG/KG)											
2,2'-Oxybis(1-chloropropane)	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2,4,5-Trichlorophenol	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
2,4,6-Trichlorophenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2,4-Dichlorophenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2,4-Dimethylphenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2,4-Dinitrophenol	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
2,4-Dinitrotoluene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2,6-Dinitrotoluene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2-Chloronaphthalene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2-Chlorophenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2-Methylnaphthalene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2-Methylphenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
2-Nitroaniline	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
2-Nitrophenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
3,3'-Dichlorobenzidine	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
3-Nitroaniline	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
4,6-Dinitro-2-methylphenol	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
4-Bromophenyl-phenylether	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
4-Chloro-3-methylphenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
4-Chloroaniline	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
4-Chlorophenyl-phenylether	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
4-Methylphenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
4-Nitroaniline	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
4-Nitrophenol	2,000 U	NA	1,000 UJ	990 U	990 UJ	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
Acenaphthene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Acenaphthylene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Anthracene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Benzo(a)anthracene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Benzo(a)pyrene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Benzo(b)fluoranthene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Benzo(g,h,i)perylene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Benzo(k)fluoranthene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U

Cheatham Annex
AOC 2
Subsurface Soil Data Raw Analytical Results
December 2010

Station ID	CAA02-A2TP01F			CAA02-A2TP01N	CAA02-A2TP02F	CAA02-A2TP02N	CAA02-A2TP03F	CAA02-A2TP03N	CAA02-A2TP04F	CAA02-A2TP04N	CAA02-A2TP05F
Sample ID	CAA02-A2-TP01-F1-1199	CAA02-A2-TP01-F-1199	CAA02-A2-TP01-FD-1199	CAA02-A2-TP01-N-1199	CAA02-A2-TP02-F-1199	CAA02-A2-TP02-N-1199	CAA02-A2-TP03-F-1199	CAA02-A2-TP03-N-1199	CAA02-A2-TP04-F-1199	CAA02-A2-TP04-N-1199	CAA02-A2-TP05-F-1199
Sample Date	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99
Chemical Name											
bis(2-Chloroethoxy)methane	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
bis(2-Chloroethyl)ether	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
bis(2-Ethylhexyl)phthalate	800 U	NA	56 J	390 U	44 J	43 J	2,500	42 J	660	410 U	150 J
Butylbenzylphthalate	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Carbazole	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Chrysene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Dibenz(a,h)anthracene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Dibenzofuran	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Diethylphthalate	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Dimethyl phthalate	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Di-n-butylphthalate	800 U	NA	76 J	390 U	65 J	50 J	68 J	46 J	79 J	46 J	65 J
Di-n-octylphthalate	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Fluoranthene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Fluorene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Hexachlorobenzene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Hexachlorobutadiene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Hexachlorocyclopentadiene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Hexachloroethane	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Indeno(1,2,3-cd)pyrene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Isophorone	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Naphthalene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
n-Nitroso-di-n-propylamine	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
n-Nitrosodiphenylamine	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Nitrobenzene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Pentachlorophenol	2,000 U	NA	1,000 U	990 U	990 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	990 U
Phenanthrene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Phenol	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Pyrene	800 U	NA	420 U	390 U	390 U	410 U	400 U	410 U	400 U	410 U	390 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											
4,4'-DDD	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
4,4'-DDE	4 UL	NA	5.4 J	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
4,4'-DDT	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
Aldrin	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
alpha-BHC	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
alpha-Chlordane	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
Aroclor-1016	40 UL	NA	42 U	39 U	39 UL	41 U	40 UL	41 UL	40 UL	42 UL	39 UL
Aroclor-1221	81 UL	NA	85 U	80 U	80 UL	83 U	82 UL	84 UL	80 UL	85 UL	79 UL
Aroclor-1232	40 UL	NA	42 U	39 U	39 UL	41 U	40 UL	41 UL	40 UL	42 UL	39 UL
Aroclor-1242	40 UL	NA	42 U	39 U	39 UL	41 U	40 UL	41 UL	40 UL	42 UL	39 UL
Aroclor-1248	40 UL	NA	42 U	39 U	39 UL	41 U	40 UL	41 UL	40 UL	42 UL	39 UL
Aroclor-1254	40 UL	NA	42 U	39 U	39 UL	41 U	40 UL	41 UL	40 UL	42 UL	39 UL
Aroclor-1260	200	NA	310	39 U	39 UL	41 U	40 UL	41 UL	40 UL	42 UL	39 UL
beta-BHC	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
delta-BHC	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
Dieldrin	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
Endosulfan I	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
Endosulfan II	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
Endosulfan sulfate	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
Endrin	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
Endrin aldehyde	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
Endrin ketone	4 UL	NA	4.2 U	3.9 U	3.9 UL	4.1 U	4 UL	4.1 UL	4 UL	4.2 UL	3.9 UL
gamma-BHC (Lindane)	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
gamma-Chlordane	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
Heptachlor	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
Heptachlor epoxide	2.1 UL	NA	2.2 U	2 U	2 UL	2.1 U	2.1 UL	2.1 UL	2 UL	2.1 UL	2 UL
Methoxychlor	21 UL	NA	22 U	20 U	20 UL	21 U	21 UL	21 UL	20 UL	21 UL	20 UL
Toxaphene	210 UL	NA	220 U	200 U	200 UL	210 U	210 UL	210 UL	200 UL	210 UL	200 UL
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PETN	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Cheatham Annex
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Subsurface Soil Data Raw Analytical Results
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Station ID	CAA02-A2TP01F			CAA02-A2TP01N	CAA02-A2TP02F	CAA02-A2TP02N	CAA02-A2TP03F	CAA02-A2TP03N	CAA02-A2TP04F	CAA02-A2TP04N	CAA02-A2TP05F
Sample ID	CAA02-A2-TP01-F1-1199	CAA02-A2-TP01-F-1199	CAA02-A2-TP01-FD-1199	CAA02-A2-TP01-N-1199	CAA02-A2-TP02-F-1199	CAA02-A2-TP02-N-1199	CAA02-A2-TP03-F-1199	CAA02-A2-TP03-N-1199	CAA02-A2-TP04-F-1199	CAA02-A2-TP04-N-1199	CAA02-A2-TP05-F-1199
Sample Date	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99	11/12/99
Chemical Name											
Total Metals (MG/KG)											
Aluminum	12,300 L	NA	8,480 L	9,150 L	6,160 L	13,700 L	9,960 L	16,100 L	6,650 L	11,400 L	5,120 L
Antimony	0.84 B	NA	0.69 B	0.51 U	2 B	0.51 UJ	12.7 U	0.63 J	0.46 B	0.81 B	11.9 U
Arsenic	3.3	NA	5	9.4	3	4.2 L	7.9	36.5	9.2	36.1	1.9 J
Barium	53.1	NA	35.8	30.7 J	32.2 J	26.6 J	31.7 J	50.2 J	31.6 J	66	26 J
Beryllium	0.6 B	NA	0.46 B	0.59 B	0.38 B	0.9 B	0.65 B	1.3 J	0.39 B	0.81 B	0.23 B
Cadmium	2.1 U	NA	1.8 U	0.08 U	12.3	0.16 U	2.1 U	0.17 U	0.9 U	0.08 UL	1 U
Calcium	36,400	NA	13,100	801 J	732 J	359 B	1,590	494 J	1,150	528 J	885 J
Chromium	37.5	NA	17.8	23.3	94.5	60.3	24.5	44	15.1	43.3	9.2
Cobalt	4.1 J	NA	4 J	3.8 J	3.4 J	6.6 J	5.5 J	10.2 J	3 J	4.6 J	2.7 J
Copper	58.3	NA	26.7	4.6 B	318	137 J	5.3 B	6.5 B	5.5 B	5.6 B	3.1 B
Cyanide	0.6 UL	NA	0.6 UL	0.02 UL	0.95 J	0.02 UL	0.6 UL	0.02 UL	0.6 UL	0.02 UL	0.6 UL
Iron	37,500 L	NA	25,400 L	20,700 L	21,100 L	38,400 L	24,300 L	38,800 L	15,000 L	24,600	10,800 L
Lead	11.4	NA	11.2	8.3	222	14.6 J	10.3	12 J	10.8	16.2	8
Magnesium	2,920	NA	825 J	456 J	391 J	1,130 J	732 J	1,530	432 J	1,080 J	293 J
Manganese	96.2	NA	112	54.7	104	73.7 J	100	84.5 J	94.7	13.7	103
Mercury	0.04 J	NA	0.04 J	0.04 J	0.03 J	0.03 U	0.03 J	0.03 U	0.04 J	0.03 B	0.06 J
Nickel	7.2 J	NA	11.2	5.8 B	11.8	12.1	12.4	18.5	5.1 J	7.4 J	4.3 J
Potassium	1,120	NA	666 J	711 J	312 J	1,560	852 J	1,820	429 J	1,650	332 J
Selenium	1 U	NA	0.9 U	0.69 U	1.1 U	0.7 U	1.1 U	0.73 U	0.9 U	0.7 UL	1 U
Silver	11	NA	7 B	6.8 B	19.7	17.8 L	6.5 B	13 L	3.9 B	9 B	2.7 B
Sodium	194 B	NA	70.4 B	18 B	25.9 B	38.5 B	30.6 B	57.5 B	31.3 B	25.9 B	20.4 B
Thallium	0.79 B	NA	1.8 UL	0.55 UL	0.64 B	0.84 L	2.1 UL	0.58 UL	1.9 UL	1.2 B	2 UL
Vanadium	29.7	NA	23.9	41.8	15.4	36.8 J	31.4	69.2 J	20.9	37.6	16.8
Zinc	120	NA	69.9 B	17.9 B	127	42.5 B	44.8 B	52.4 B	60.4 B	42.8 B	23.7 B

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BJ - See 'B' and 'J'

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

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Subsurface Soil Data Raw Analytical Results
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Station ID	CAA02-A2TP05N		CAA02-A2TP06F	CAA02-A2TP06N
Sample ID	CAA02-A2-TP05-N-1199	CAA02-A2-TP05-ND-1199	CAA02-A2-TP06-F-1199	CAA02-A2-TP06-N-1199
Sample Date	11/12/99	11/12/99	11/12/99	11/12/99
Chemical Name				
Volatile Organic Compounds (UG/KG)				
1,1,1-Trichloroethane	13.0 U	10 UL	12.8 U	10 UL
1,1,2,2-Tetrachloroethane	13.0 U	10 UL	12.8 U	10 UL
1,1,2-Trichloroethane	13.0 U	10 UL	12.8 U	10 UL
1,1-Dichloroethane	13.0 U	10 UL	12.8 U	10 UL
1,1-Dichloroethene	13.0 U	10 UL	12.8 U	10 UL
1,2,4-Trichlorobenzene	410 U	410 U	420 U	400 U
1,2-Dichlorobenzene	410 U	410 U	420 U	400 U
1,2-Dichloroethane	13.0 U	10 UL	12.8 U	10 UL
1,2-Dichloroethene (total)	13.0 U	10 UL	12.8 U	10 UL
1,2-Dichloropropane	13.0 U	10 UL	12.8 U	10 UL
1,3-Dichlorobenzene	410 U	410 U	420 U	400 U
1,4-Dichlorobenzene	410 U	410 U	420 U	400 U
2-Butanone	3 B	10 UL	12.8 U	10 UL
2-Hexanone	13.0 U	10 UL	12.8 U	10 UL
4-Methyl-2-pentanone	13.0 U	10 UL	12.8 U	10 UL
Acetone	6 B	17 B	12 B	36 B
Benzene	13.0 U	10 UL	12.8 U	10 UL
Bromodichloromethane	13.0 U	10 UL	12.8 U	10 UL
Bromoform	13.0 U	10 UL	12.8 U	10 UL
Bromomethane	13.0 U	10 UL	12.8 U	10 UL
Carbon disulfide	13.0 U	10 UL	12.8 U	10 UL
Carbon tetrachloride	13.0 U	10 UL	12.8 U	10 UL
Chlorobenzene	13.0 U	10 UL	12.8 U	10 UL
Chloroethane	13.0 U	10 UL	12.8 U	10 UL
Chloroform	13.0 U	10 UL	12.8 U	10 UL
Chloromethane	13.0 U	10 UL	12.8 U	10 UL
cis-1,3-Dichloropropene	13.0 U	10 UL	12.8 U	10 UL
Dibromochloromethane	13.0 U	10 UL	12.8 U	10 UL
Ethylbenzene	13.0 U	10 UL	12.8 U	0.7 J
Methylene chloride	9 B	34 B	11 B	27 B
Styrene	13.0 U	10 UL	12.8 U	4 J
Tetrachloroethene	13.0 U	10 UL	12.8 U	10 UL
Toluene	13.0 U	10 UL	12.8 U	10 UL
trans-1,3-Dichloropropene	13.0 U	10 UL	12.8 U	10 UL
Trichloroethene	13.0 U	10 UL	12.8 U	10 UL
Vinyl chloride	13.0 U	10 UL	12.8 U	10 UL
Xylene, total	2 J	2 J	12.8 U	2 J
Semivolatile Organic Compounds (UG/KG)				
2,2'-Oxybis(1-chloropropane)	410 U	410 U	420 U	400 U
2,4,5-Trichlorophenol	1,000 U	1,000 U	1,100 U	1,000 U
2,4,6-Trichlorophenol	410 U	410 U	420 U	400 U
2,4-Dichlorophenol	410 U	410 U	420 U	400 U
2,4-Dimethylphenol	410 U	410 U	420 U	400 U
2,4-Dinitrophenol	1,000 U	1,000 U	1,100 U	1,000 U
2,4-Dinitrotoluene	410 U	410 U	420 U	400 U
2,6-Dinitrotoluene	410 U	410 U	420 U	400 U
2-Chloronaphthalene	410 U	410 U	420 U	400 U
2-Chlorophenol	410 U	410 U	420 U	400 U
2-Methylnaphthalene	410 U	410 U	420 U	400 U
2-Methylphenol	410 U	410 U	420 U	400 U
2-Nitroaniline	1,000 U	1,000 U	1,100 U	1,000 U
2-Nitrophenol	410 U	410 U	420 U	400 U
3,3'-Dichlorobenzidine	410 U	410 U	420 U	400 U
3-Nitroaniline	1,000 U	1,000 U	1,100 U	1,000 U
4,6-Dinitro-2-methylphenol	1,000 U	1,000 U	1,100 U	1,000 U
4-Bromophenyl-phenylether	410 U	410 U	420 U	400 U
4-Chloro-3-methylphenol	410 U	410 U	420 U	400 U
4-Chloroaniline	410 U	410 U	420 U	400 U
4-Chlorophenyl-phenylether	410 U	410 U	420 U	400 U
4-Methylphenol	410 U	410 U	420 U	400 U
4-Nitroaniline	1,000 U	1,000 U	1,100 U	1,000 U
4-Nitrophenol	1,000 U	1,000 U	1,100 U	1,000 U
Acenaphthene	410 U	410 U	420 U	400 U
Acenaphthylene	410 U	410 U	420 U	400 U
Anthracene	410 U	410 U	420 U	400 U
Benzo(a)anthracene	410 U	410 U	420 U	400 U
Benzo(a)pyrene	410 U	410 U	420 U	400 U
Benzo(b)fluoranthene	410 U	410 U	420 U	400 U
Benzo(g,h,i)perylene	410 U	410 U	420 U	400 U
Benzo(k)fluoranthene	410 U	410 U	420 U	400 U

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Station ID	CAA02-A2TP05N		CAA02-A2TP06F	CAA02-A2TP06N
Sample ID	CAA02-A2-TP05-N-1199	CAA02-A2-TP05-ND-1199	CAA02-A2-TP06-F-1199	CAA02-A2-TP06-N-1199
Sample Date	11/12/99	11/12/99	11/12/99	11/12/99
Chemical Name				
bis(2-Chloroethoxy)methane	410 U	410 U	420 U	400 U
bis(2-Chloroethyl)ether	410 U	410 U	420 U	400 U
bis(2-Ethylhexyl)phthalate	410 U	410 U	420 U	400 U
Butylbenzylphthalate	410 U	410 U	420 U	400 U
Carbazole	410 U	410 U	420 U	400 U
Chrysene	410 U	410 U	420 U	400 U
Dibenz(a,h)anthracene	410 U	410 U	420 U	400 U
Dibenzofuran	410 U	410 U	420 U	400 U
Diethylphthalate	410 U	410 U	420 U	400 U
Dimethyl phthalate	410 U	410 U	420 U	400 U
Di-n-butylphthalate	51 J	410 U	420 U	47 J
Di-n-octylphthalate	410 U	410 U	420 U	400 U
Fluoranthene	410 U	410 U	420 U	400 U
Fluorene	410 U	410 U	420 U	400 U
Hexachlorobenzene	410 U	410 U	420 U	400 U
Hexachlorobutadiene	410 U	410 U	420 U	400 U
Hexachlorocyclopentadiene	410 U	410 U	420 U	400 U
Hexachloroethane	410 U	410 U	420 U	400 U
Indeno(1,2,3-cd)pyrene	410 U	410 U	420 U	400 U
Isophorone	410 U	410 U	420 U	400 U
Naphthalene	410 U	410 U	420 U	400 U
n-Nitroso-di-n-propylamine	410 U	410 U	420 U	400 U
n-Nitrosodiphenylamine	410 U	410 U	420 U	400 U
Nitrobenzene	410 U	410 U	420 U	400 U
Pentachlorophenol	1,000 U	1,000 U	1,100 U	1,000 U
Phenanthrene	410 U	410 U	420 U	400 U
Phenol	410 U	410 U	420 U	400 U
Pyrene	410 U	410 U	420 U	400 U
Pesticide/Polychlorinated Biphenyls (UG/KG)				
4,4'-DDD	4.1 U	4.2 UL	4.2 UL	4 UL
4,4'-DDE	4.1 U	4.2 UL	4.2 UL	4 UL
4,4'-DDT	4.1 U	4.2 UL	4.2 UL	4 UL
Aldrin	2.1 U	2.2 UL	2.2 UL	2.1 UL
alpha-BHC	2.1 U	2.2 UL	2.2 UL	2.1 UL
alpha-Chlordane	2.1 U	2.2 UL	2.2 UL	2.1 UL
Aroclor-1016	41 U	42 UL	42 UL	40 UL
Aroclor-1221	84 U	86 UL	85 UL	82 UL
Aroclor-1232	41 U	42 UL	42 UL	40 UL
Aroclor-1242	41 U	42 UL	42 UL	40 UL
Aroclor-1248	41 U	42 UL	42 UL	40 UL
Aroclor-1254	41 U	42 UL	42 UL	40 UL
Aroclor-1260	41 U	42 UL	42 UL	40 UL
beta-BHC	2.1 U	2.2 UL	2.2 UL	2.1 UL
delta-BHC	2.1 U	2.2 UL	2.2 UL	2.1 UL
Dieldrin	4.1 U	4.2 UL	4.2 UL	4 UL
Endosulfan I	2.1 U	2.2 UL	2.2 UL	2.1 UL
Endosulfan II	4.1 U	4.2 UL	4.2 UL	4 UL
Endosulfan sulfate	4.1 U	4.2 UL	4.2 UL	4 UL
Endrin	4.1 U	4.2 UL	4.2 UL	4 UL
Endrin aldehyde	4.1 U	4.2 UL	4.2 UL	4 UL
Endrin ketone	4.1 U	4.2 UL	4.2 UL	4 UL
gamma-BHC (Lindane)	2.1 U	2.2 UL	2.2 UL	2.1 UL
gamma-Chlordane	2.1 U	2.2 UL	2.2 UL	2.1 UL
Heptachlor	2.1 U	2.2 UL	2.2 UL	2.1 UL
Heptachlor epoxide	2.1 U	2.2 UL	2.2 UL	2.1 UL
Methoxychlor	21 U	22 UL	22 UL	21 UL
Toxaphene	210 U	220 UL	220 UL	210 UL
Explosives (UG/KG)				
1,3,5-Trinitrobenzene	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA
HMX	NA	NA	NA	NA
PETN	NA	NA	NA	NA
RDX	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA

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Station ID	CAA02-A2TP05N		CAA02-A2TP06F	CAA02-A2TP06N
Sample ID	CAA02-A2-TP05-N-1199	CAA02-A2-TP05-ND-1199	CAA02-A2-TP06-F-1199	CAA02-A2-TP06-N-1199
Sample Date	11/12/99	11/12/99	11/12/99	11/12/99
Chemical Name				
Total Metals (MG/KG)				
Aluminum	12,100 L	12,900 L	11,800 L	11,600 L
Antimony	0.64 B	0.5 B	11.6 U	0.84 B
Arsenic	16	16	4.3	21.2
Barium	17.2 J	17.5 J	44.5	29.7 J
Beryllium	0.96 J	0.92 J	0.45 B	0.97 J
Cadmium	0.08 UL	0.08 UL	1 U	0.08 UL
Calcium	153 J	183 J	1,180	472 J
Chromium	34.8	38.8	20.3	29.8
Cobalt	5.8 J	6.3 J	3.8 J	9.2 J
Copper	6.8 B	6.2 B	14.6	134
Cyanide	0.02 UL	0.02 UL	0.6 UL	0.02 UL
Iron	33,800	36,700	25,800 L	34,300
Lead	9	9.1	11.8	12.6
Magnesium	954 J	1,020 J	541 J	844 J
Manganese	45.6	44.6	121	70.9
Mercury	0.05 B	0.03 B	0.05 J	0.07 J
Nickel	14.4	16.3	8.4	24.4
Potassium	1,270	1,340	676 J	1,130
Selenium	0.69 UL	0.69 UL	1 U	0.67 UL
Silver	11.7 J	13.7 J	7.1 B	12 J
Sodium	39.5 B	33.9 B	32.6 B	36 B
Thallium	0.85 B	1.4 B	0.78 B	0.88 B
Vanadium	35.5	35.4	36.9	36.7
Zinc	39.8 B	47.9 B	96.2	61.4 B

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

BJ - See 'B' and 'J'

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

Cheatham Annex
AOC 2
Groundwater Data Raw Analytical Results
December 2010

Station ID	CAA02-A2DPW01	CAA02-A2DPW02	CAA02-A2DPW03		CAA02-A2DPW04
Sample ID	CAA02-A2DPW01-1098	CAA02-A2DPW02-1098	CAA02-A2DPW03-1098	CAA02-A2DPW03P-1098	CAA02-A2DPW04-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name					
Volatile Organic Compounds (UG/L)					
1,1,1-Trichloroethane	10 U	10 UL	10 UL	10 UL	10 UL
1,1,2,2-Tetrachloroethane	10 U	10 UL	10 UL	10 UL	10 UL
1,1,2-Trichloroethane	10 U	10 UL	10 UL	10 UL	10 UL
1,1-Dichloroethane	10 U	10 UL	10 UL	10 UL	10 UL
1,1-Dichloroethene	10 U	10 UL	10 UL	10 UL	10 UL
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 UL	10 UL	10 UL	10 UL
1,2-Dichloroethene (total)	10 U	10 UL	10 UL	10 UL	10 UL
1,2-Dichloropropane	10 U	10 UL	10 UL	10 UL	10 UL
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 UL	10 UL	10 UL	10 UL
2-Hexanone	10 U	10 UL	10 UL	10 UL	10 UL
4-Methyl-2-pentanone	10 U	10 UL	10 UL	10 UL	10 UL
Acetone	10 U	10 UL	10 UL	10 UL	10 UL
Benzene	10 U	10 UL	10 UL	10 UL	10 UL
Bromodichloromethane	10 U	10 UL	10 UL	10 UL	10 UL
Bromoform	10 U	10 UL	10 UL	10 UL	10 UL
Bromomethane	10 U	10 UL	10 UL	10 UL	10 UL
Carbon disulfide	10 U	10 UL	10 UL	10 UL	10 UL
Carbon tetrachloride	10 U	10 UL	10 UL	10 UL	10 UL
Chlorobenzene	10 U	10 UL	10 UL	10 UL	10 UL
Chloroethane	10 U	10 UL	10 UL	10 UL	10 UL
Chloroform	10 U	10 UL	10 UL	10 UL	10 UL
Chloromethane	10 U	10 UL	10 UL	10 UL	10 UL
cis-1,3-Dichloropropene	10 U	10 UL	10 UL	10 UL	10 UL
Dibromochloromethane	10 U	10 UL	10 UL	10 UL	10 UL
Ethylbenzene	10 U	10 UL	10 UL	10 UL	10 UL
Methylene chloride	10 U	10 UL	10 UL	10 UL	10 UL
Styrene	10 U	10 UL	10 UL	10 UL	10 UL
Tetrachloroethene	10 U	10 UL	10 UL	10 UL	10 UL
Toluene	10 U	10 UL	10 UL	10 UL	10 UL
trans-1,3-Dichloropropene	10 U	10 UL	10 UL	10 UL	10 UL
Trichloroethene	10 U	10 UL	10 UL	10 UL	10 UL
Vinyl chloride	10 U	10 UL	10 UL	10 UL	10 UL
Xylene, total	10 U	10 UL	10 UL	10 UL	10 UL
Semivolatile Organic Compounds (UG/L)					
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	1 U	1 U	1 U	1 U	1 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U

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Station ID	CAA02-A2DPW01	CAA02-A2DPW02	CAA02-A2DPW03		CAA02-A2DPW04
Sample ID	CAA02-A2DPW01-1098	CAA02-A2DPW02-1098	CAA02-A2DPW03-1098	CAA02-A2DPW03P-1098	CAA02-A2DPW04-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name					
4-Methylphenol	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroisopropyl)ether	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	3 B	2 B	1 B	2 B	2 B
Butylbenzylphthalate	10 U	10 U	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	1 J	10 U	10 U	10 U	10 U
Dimethyl phthalate	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U	10 U
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	10 U	10 U
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	1 U	1 U	1 U	1 U	1 U
Pentachlorophenol	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10 U	10 U	10 U	10 U	10 U
Phenol	10 U	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U	10 U	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)					
4,4'-DDD	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
4,4'-DDE	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
4,4'-DDT	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
Aldrin	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
alpha-BHC	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
alpha-Chlordane	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
Aroclor-1016	1 UJ	1 UJ	1 UJ	1 R	1 R
Aroclor-1221	2 UJ	2 UJ	2 UJ	2 R	2 R
Aroclor-1232	1 UJ	1 UJ	1 UJ	1 R	1 R
Aroclor-1242	1 UJ	1 UJ	1 UJ	1 R	1 R
Aroclor-1248	1 UJ	1 UJ	1 UJ	1 R	1 R
Aroclor-1254	1 UJ	1 UJ	1 UJ	1 R	1 R
Aroclor-1260	1 UJ	1 UJ	1 UJ	1 R	1 R
beta-BHC	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
delta-BHC	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
Dieldrin	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
Endosulfan I	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
Endosulfan II	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
Endosulfan sulfate	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R

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Station ID	CAA02-A2DPW01	CAA02-A2DPW02	CAA02-A2DPW03		CAA02-A2DPW04
Sample ID	CAA02-A2DPW01-1098	CAA02-A2DPW02-1098	CAA02-A2DPW03-1098	CAA02-A2DPW03P-1098	CAA02-A2DPW04-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name					
Endrin	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
Endrin aldehyde	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
Endrin ketone	0.1 UJ	0.1 UJ	0.1 UJ	0.1 R	0.1 R
gamma-BHC (Lindane)	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
gamma-Chlordane	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
Heptachlor	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
Heptachlor epoxide	0.05 UJ	0.05 UJ	0.05 UJ	0.05 R	0.05 R
Methoxychlor	0.5 UJ	0.5 UJ	0.5 UJ	0.5 R	0.5 R
Toxaphene	5 UJ	5 UJ	5 UJ	5 R	5 R
Explosives (UG/L)					
1,3,5-Trinitrobenzene	1 U	1 U	1 U	1 U	1 U
1,3-Dinitrobenzene	1 U	1 U	1 U	1 U	1 U
2,4,6-Trinitrotoluene	1 U	1 U	1 U	1 U	1 U
2-Amino-4,6-dinitrotoluene	1 U	1 U	1 U	1 U	1 U
2-Nitrotoluene	1 U	1 U	1 U	1 U	1 U
3-Nitrotoluene	1 U	1 U	1 U	1 U	1 U
4-Amino-2,6-dinitrotoluene	1 U	1 U	1 U	1 U	1 U
4-Nitrotoluene	1 U	1 U	1 U	1 U	1 U
HMX	1 U	1 U	1 U	1 U	1 U
PETN	1 U	1 U	1 U	1 U	1 U
RDX	1 U	1 U	1 U	1 U	1 U
Tetryl	1 U	1 U	1 U	1 U	1 U
Total Metals (UG/L)					
Aluminum	189,000	59,300	2,110	2,210	96,700
Antimony	13.8	7.7	2.4 U	2.4 U	11.3
Arsenic	181	89.9	3.7 J	5.1 J	430
Barium	510	195 J	36.5 J	38.3 J	275
Beryllium	9.6	3.3 J	0.2 U	0.2 U	5.7
Cadmium	8.7	5.9	4.3 U	4.3 U	6.5
Calcium	2,520,000	722,000	153,000	160,000	1,230,000
Chromium	595	229	9.6 J	10	364
Cobalt	73.7	32.2 J	6.3 U	6.3 U	45.6 J
Copper	99.5	37	4.1 U	4.1 U	45.9
Cyanide	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U
Iron	380,000	133,000	5,550	5,630	262,000
Lead	94.6	36.1	1 U	1.2 B	53.7
Magnesium	51,900	17,900	2,270	2,340	31,800
Manganese	1,360	394	36.7	37.5	684
Mercury	0.15 B	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	170	70.7	9.6 U	9.6 U	109
Potassium	55,400	18,800	1,780 J	1,710 J	36,500
Selenium	2.2 U	4.6 K	2.2 U	2.9 K	2.2 U
Silver	1 U	1 U	1 U	1 U	1 U
Sodium	18,900	12,600	7,190	7,290	13,100
Thallium	1.2 L	2 J	1.2 U	1.2 U	1.2 U
Vanadium	417	205	6.1 J	4.8 J	309
Zinc	667	264	13.5 J	13.3 J	424
Dissolved Metals (UG/L)					
Aluminum, Dissolved	210	172 J	167 J	193 J	159 J
Antimony, Dissolved	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U
Arsenic, Dissolved	2.4 J	3.6 J	1.8 U	1.8 U	5.5 J
Barium, Dissolved	35.2 J	36.4 J	27.3 J	27 J	23.2 J
Beryllium, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Cadmium, Dissolved	4.3 U	4.3 U	4.3 U	4.3 U	4.3 U
Calcium, Dissolved	158,000	143,000	132,000	132,000	133,000
Chromium, Dissolved	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
Cobalt, Dissolved	6.3 U	6.3 U	6.3 U	6.3 U	6.3 U
Copper, Dissolved	4.1 U	4.2 J	4.1 U	4.5 J	6.5 J

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Station ID	CAA02-A2DPW01	CAA02-A2DPW02	CAA02-A2DPW03		CAA02-A2DPW04
Sample ID	CAA02-A2DPW01-1098	CAA02-A2DPW02-1098	CAA02-A2DPW03-1098	CAA02-A2DPW03P-1098	CAA02-A2DPW04-1098
Sample Date	10/22/98	10/22/98	10/22/98	10/22/98	10/22/98
Chemical Name					
Iron, Dissolved	56.6 J	53.2 J	92.7 J	86.2 J	208
Lead, Dissolved	1 B	1.5 B	1 U	1.7 B	1.9 B
Magnesium, Dissolved	2,240	3,730	1,600	1,620	1,710
Manganese, Dissolved	164	317	24.1	23.8	25
Mercury, Dissolved	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel, Dissolved	9.6 U	9.6 U	9.6 U	9.6 U	9.6 U
Potassium, Dissolved	1,000 J	2,060 J	869 J	861 J	1,060 J
Selenium, Dissolved	2.2 U	7.5 K	2.2 U	2.2 U	2.2 U
Silver, Dissolved	1 U	1 U	1 U	1 U	1 U
Sodium, Dissolved	6,980	9,840	7,040	6,910	6,080
Thallium, Dissolved	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Vanadium, Dissolved	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U
Zinc, Dissolved	7.1 J	8 J	6.8 U	11.8 J	7.5 J

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 2\[3_AOC2_GW_raw.xls], Victoria Brynildsen, 12/01/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

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Station ID	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO05	CAA06-SO06		CAA06-SO07	CAA06-SO08	CAA06-SO09		CAA06-SO10
Sample ID	CAA06-SS01-1008	CAA06-SS02-1008	CAA06-SS03-1008	CAA06-SS04-1008	CAA06-SS05-1008	CAA06-SS06-1008	CAA06-SS06P-1008	CAA06-SS07-1108	CAA06-SS08-1108	CAA06-SS09-1108	CAA06-SS09P-1108	CAA06-SS10-1108
Sample Date	10/20/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name												
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2,2'-Oxybis(1-chloropropane)	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2,4,5-Trichlorophenol	1,000 U	950 U	960 U	940 U	960 U	960 U	940 U	1,200 U	1,100 U	1,200 U	1,000 U	1,300 U
2,4,6-Trichlorophenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2,4-Dichlorophenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2,4-Dimethylphenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2,4-Dinitrophenol	1,000 U	950 U	960 U	940 U	960 U	960 U	940 U	1,200 U	1,100 U	1,200 U	1,000 U	1,300 U
2,4-Dinitrotoluene	6,300 L	140 J	100 U	100 U	420	100 U	100 U	100 U	99 U	100 U	100 U	100 U
2,6-Dinitrotoluene	410 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	510
2-Chloronaphthalene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2-Chlorophenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2-Methylnaphthalene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2-Methylphenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
2-Nitroaniline	1,000 U	950 U	960 U	940 U	960 U	960 U	940 U	1,200 U	1,100 U	1,200 U	290 J	1,300 U
2-Nitrophenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
3,3'-Dichlorobenzidine	410 UJ	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
3-Nitroaniline	1,000 U	950 U	960 U	940 U	960 U	960 U	940 UJ	1,200 U	1,100 U	1,200 U	1,000 U	1,300 U
4,6-Dinitro-2-methylphenol	1,000 U	950 U	960 U	940 U	960 U	960 U	940 U	1,200 U	1,100 U	1,200 U	1,000 U	1,300 U
4-Bromophenyl-phenylether	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
4-Chloro-3-methylphenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
4-Chloroaniline	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
4-Chlorophenyl-phenylether	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
4-Methylphenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
4-Nitroaniline	1,000 U	950 U	960 U	940 U	960 U	960 U	940 R	1,200 U	1,100 U	1,200 U	1,000 U	1,300 U
4-Nitrophenol	1,000 U	950 U	960 U	940 U	960 U	960 U	940 U	1,200 R	1,100 R	1,200 R	1,000 R	1,300 R
Acenaphthene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Acenaphthylene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Acetophenone	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Anthracene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Atrazine	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Benzaldehyde	320 J	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Benzo(a)anthracene	110 J	380 U	380 U	380 U	230 J	140 J	230 J	460 U	430 U	480 U	410 U	510 U
Benzo(a)pyrene	410 UJ	380 U	380 U	380 U	270 J	140 J	220 J	460 U	430 U	480 U	410 U	510 U
Benzo(b)fluoranthene	410 UJ	380 U	380 U	380 U	230 J	130 J	200 J	460 U	430 U	480 U	410 U	510 U
Benzo(g,h,i)perylene	410 UJ	380 U	380 U	380 U	160 J	380 U	130 J	460 U	430 U	480 U	410 U	510 U
Benzo(k)fluoranthene	410 UJ	380 U	380 U	380 U	190 J	110 J	170 J	460 U	430 U	480 U	410 U	510 U
bis(2-Chloroethoxy)methane	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
bis(2-Chloroethyl)ether	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
bis(2-Ethylhexyl)phthalate	410 UJ	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Butylbenzylphthalate	410 UJ	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Caprolactam	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Carbazole	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Chrysene	150 J	380 U	380 U	380 U	440	250 J	440	460 U	430 U	480 U	410 U	510 U
Dibenz(a,h)anthracene	410 UJ	380 U	380 U	380 U	380 UJ	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Dibenzofuran	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Diethylphthalate	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Dimethyl phthalate	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Di-n-butylphthalate	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Di-n-octylphthalate	410 UJ	380 U	380 U	380 U	380 UJ	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Fluoranthene	300 J	380 U	380 U	380 U	320 J	160 J	240 J	460 U	430 U	480 U	410 U	510 U

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Station ID	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO05	CAA06-SO06		CAA06-SO07	CAA06-SO08	CAA06-SO09		CAA06-SO10
Sample ID	CAA06-SS01-1008	CAA06-SS02-1008	CAA06-SS03-1008	CAA06-SS04-1008	CAA06-SS05-1008	CAA06-SS06-1008	CAA06-SS06P-1008	CAA06-SS07-1108	CAA06-SS08-1108	CAA06-SS09-1108	CAA06-SS09P-1108	CAA06-SS10-1108
Sample Date	10/20/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name												
Fluorene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Hexachlorobenzene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Hexachlorobutadiene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Hexachlorocyclopentadiene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Hexachloroethane	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Indeno(1,2,3-cd)pyrene	410 UJ	380 U	380 U	380 U	100 J	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Isophorone	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Naphthalene	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
n-Nitroso-di-n-propylamine	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
n-Nitrosodiphenylamine	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Nitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U
Pentachlorophenol	1,000 U	950 U	960 U	940 U	960 U	960 U	940 U	1,200 U	1,100 U	1,200 U	1,000 U	1,300 U
Phenanthrene	410 U	380 U	380 U	380 U	280 J	120 J	210 J	460 U	430 U	480 U	410 U	510 U
Phenol	410 U	380 U	380 U	380 U	380 U	380 U	380 U	460 U	430 U	480 U	410 U	510 U
Pyrene	580 J	380 U	380 U	380 U	790	380 J	600	460 U	430 U	480 U	410 U	170 J
Explosives (UG/KG)												
1,3,5-Trinitrobenzene	620 K	250	100 U	100 U	100 U	120	100 U	100 U	99 U	100 U	100 U	2,100
1,3-Dinitrobenzene	730 J	84 J	100 UJ	100 U	100	100 U	100 U	100 U	99 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	4,500,000	320,000	6,600	170	990	2,000	2,900	100 U	99 U	100 U	100 U	150
2-Amino-4,6-dinitrotoluene	100 UJ	16,000 J	1,400 J	100 U	100 U	120	110	100 U	99 U	100 U	100 U	100 U
2-Nitrotoluene	40,000 R	48,000 J	200 UJ	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 UJ	100 UJ	100 UJ	100 UJ
3-Nitrotoluene	40,000 R	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	20,000 R	17,000	1,400	100 U	100 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U
4-Nitrotoluene	40,000 R	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	20,000
Nitroglycerin	2,500 UJ	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
Nitroguanidine	10 U	10 U	10 U	130 U	130 U	120 U	130 U	120 U	130 U	130 U	120 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	220	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	640	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)												
Aluminum	10,600	10,400	25,000	9,630	11,100	4,800	4,800	5,230	6,780	8,740	8,420	8,220
Antimony	14 UL	4.1 UL	0.21 L	0.1 L	6.2 UL	0.06 L	0.06 L	4.5 UL	7.4 UL	6.4 UL	7 UL	0.73 L
Arsenic	8.1 J	3.5 J	11.8 J	3.6 J	3.6 J	2.2 J	2 J	2.7 L	3.3 L	4.1 L	3.3 L	3.3 L
Barium	31	22.9	45.7	18.8 J	31.4	16.2 J	14.6 J	21.2 K	18.3 K	79.9 K	66.3 K	16.6 K
Beryllium	0.34 J	0.36	0.55	0.29 J	0.42 J	0.17 J	0.15 J	0.4	0.26 J	0.73	0.65	0.27 J
Cadmium	0.06 J	0.09 J	0.12 J	0.04 J	0.09 J	0.08 J	0.07 J	0.38 U	0.05 B	0.12 J	0.09 J	0.04 B
Calcium	2,260	748	1,980	1,210	514	268 J	97.6 J	304 J	869	3,740	2,790	1,760
Chromium	16.8 L	12.5 L	34.7 L	16.2 L	12.9 L	6.7 L	6.8 L	6.1	8.6	8.8	8.2	12.5
Cobalt	3.6 J	2.2 J	3.4 J	1.9 J	2.2 J	0.86 J	0.85 J	2.6 J	1.3 J	3.2 J	2.8 J	1.7 J
Copper	9.8	6.7	5.5	3.6	5.3	31.6	29.6	2.2 B	4.8 B	4.6 B	4.7 B	6.3 B
Cyanide	0.6 U	0.55 U	0.55 U	0.5 U	0.55 U	0.6 U	0.55 U	0.7 U	0.6 U	0.7 U	0.55 U	0.75 U
Iron	37,100 J	9,000 J	21,700 J	9,010 J	8,680 J	4,860 J	4,940 J	4,780	6,270	6,050	5,320	6,170
Lead	580 J	72.9 J	42.8 J	9.9 J	22.6 J	69.6 J	73.6 J	10.8	18.5	30.2	26	26.4
Magnesium	896 J	672	1,270	694	767	332 J	312 J	406	468 J	861	772	533
Manganese	175	43.3	32.8	25.4	49.5	24.9	20.7	50.5 L	30.9 L	284 L	243 L	29.2 L
Mercury	0.13 L	0.05 L	0.12 UL	0.11 UL	0.06 L	0.14	0.18	0.15 UL	0.06 L	0.06 L	0.07 L	0.16 UL
Nickel	10.1	6.6	10	4.8	7	3.1 J	3 J	3.7	4.1 J	6.2	5.9	4.6
Potassium	719	620	1,520	875	496 J	264 J	260 J	254 J	438 J	521 J	477 J	495 J

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Station ID	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO05	CAA06-SO06		CAA06-SO07	CAA06-SO08	CAA06-SO09		CAA06-SO10
Sample ID	CAA06-SS01-1008	CAA06-SS02-1008	CAA06-SS03-1008	CAA06-SS04-1008	CAA06-SS05-1008	CAA06-SS06-1008	CAA06-SS06P-1008	CAA06-SS07-1108	CAA06-SS08-1108	CAA06-SS09-1108	CAA06-SS09P-1108	CAA06-SS10-1108
Sample Date	10/20/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name												
Selenium	2 J	0.38 J	0.91 J	3.8 U	0.39 J	3.6 U	3.1 U	2.6 U	4.3 U	3.7 U	4.1 U	3 U
Silver	2.3 U	0.69 U	0.95 U	1.1 U	1 U	1 U	0.89 U	0.75 U	1.2 U	1.1 U	1.2 U	0.87 U
Sodium	68 J	29.5 J	58.7 J	28.6 J	51.1 J	34.2 J	30.7 J	19 B	36.3 B	31.4 B	29.2 B	45 B
Thallium	5.7 U	1.7 U	0.18 J	2.7 U	2.6 U	2.6 U	2.2 U	1.9 U	3.1 U	2.7 U	2.9 U	0.16 B
Vanadium	26.6	19.6	50	22.1	22	12.5	12.4	10.3	18.1	17.3	15.6	17
Zinc	96.7	54.9	176	17	30.1	16.6	15	12.2 K	18.6 K	25 K	19.9 K	22.1 K
Wet Chemistry												
% Solids (pct)	80	88	86	88	87	86	88	72	76	69	81	65
pH (ph)	4.6	6.8	7.1	7.1	4.9	4.3	NA	5.4	5	6.3	NA	6.3
Total organic carbon (TOC) (ug/g)	120,000 J	7,300 J	6,200 J	27,000 J	42,000 J	50,000 J	NA	22,000	49,000	52,000	NA	40,000

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA06-SO11	CAA06-SO12	CAA06-SO13	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID	CAA06-SS11-1108	CAA06-SS12-1108	CAA06-SS13-1108	CAA06-SS14-1108	CAA06-SS15-1108	CAA06-SS16-1108	CAA06-SS17-1108	CAA06-SS18-1108	CAA06-SS19-1108	CAA06-SS19P-1108
Sample Date	11/06/08	11/06/08	11/06/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name										
Semivolatile Organic Compounds (UG/KG)										
1,1-Biphenyl	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2,2'-Oxybis(1-chloropropane)	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2,4,5-Trichlorophenol	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
2,4,6-Trichlorophenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2,4-Dichlorophenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2,4-Dimethylphenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2,4-Dinitrophenol	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
2,4-Dinitrotoluene	100 U	100 U	290	99 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	420 U	380 U	380 U	100 UL	100 UL	370 U	370 U
2-Chloronaphthalene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2-Chlorophenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2-Methylnaphthalene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2-Methylphenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
2-Nitroaniline	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
2-Nitrophenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
3,3'-Dichlorobenzidine	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
3-Nitroaniline	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
4,6-Dinitro-2-methylphenol	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
4-Bromophenyl-phenylether	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
4-Chloro-3-methylphenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
4-Chloroaniline	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
4-Chlorophenyl-phenylether	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
4-Methylphenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
4-Nitroaniline	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
4-Nitrophenol	1,100 R	1,000 R	940 R	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
Acenaphthene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Acenaphthylene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Acetophenone	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Anthracene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Atrazine	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Benzaldehyde	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Benzo(a)anthracene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Benzo(a)pyrene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Benzo(b)fluoranthene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Benzo(g,h,i)perylene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Benzo(k)fluoranthene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
bis(2-Chloroethoxy)methane	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
bis(2-Chloroethyl)ether	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
bis(2-Ethylhexyl)phthalate	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Butylbenzylphthalate	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Caprolactam	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Carbazole	420 U	400 UJ	370 UJ	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Chrysene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Dibenz(a,h)anthracene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Dibenzofuran	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Diethylphthalate	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Dimethyl phthalate	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Di-n-butylphthalate	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Di-n-octylphthalate	420 U	400 U	370 U	420 UJ	380 U	380 U	390 R	360 R	370 U	370 U
Fluoranthene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U

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Station ID	CAA06-SO11	CAA06-SO12	CAA06-SO13	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID	CAA06-SS11-1108	CAA06-SS12-1108	CAA06-SS13-1108	CAA06-SS14-1108	CAA06-SS15-1108	CAA06-SS16-1108	CAA06-SS17-1108	CAA06-SS18-1108	CAA06-SS19-1108	CAA06-SS19P-1108
Sample Date	11/06/08	11/06/08	11/06/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name										
Fluorene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Hexachlorobenzene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Hexachlorobutadiene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Hexachlorocyclopentadiene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Hexachloroethane	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Indeno(1,2,3-cd)pyrene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Isophorone	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Naphthalene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
n-Nitroso-di-n-propylamine	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
n-Nitrosodiphenylamine	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Nitrobenzene	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U
Pentachlorophenol	1,100 U	1,000 U	940 U	1,000 U	960 U	950 U	990 R	910 R	940 U	930 U
Phenanthrene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Phenol	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Pyrene	420 U	400 U	370 U	420 U	380 U	380 U	390 R	360 R	370 U	370 U
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	100 U	100 U	1,100	99 U	100 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	290	99 U	100 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U	51,000	99 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	15,000	99 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
3,5-Dinitroaniline	100 U	100 U	890	99 U	100 U	100 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	14,000	99 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
Nitroguanidine	130 U	130 U	120 U	130 U	120 U	130 U	130 U	130 U	130 U	120 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)										
Aluminum	4,390	11,100	11,400	7,560	8,530	8,710	7,850	5,040	10,300	12,800
Antimony	4.8 UL	6.3 UL	4 UL	0.11 L	0.5 L	0.07 L	0.05 L	4.5 UL	5.1 UL	5.1 UL
Arsenic	1.8 L	3.9 L	5 L	3.1	3	4.4	2.4	2.6	4.1	4.9
Barium	16.1 K	27.4 K	25.2 K	31	35.4	32.2	28	45.8	32	37.7
Beryllium	0.22 J	0.39 J	0.39	0.53	0.35 J	0.42	0.34	0.28 J	0.36 J	0.42 J
Cadmium	0.03 B	0.53 U	0.02 B	0.07 J	0.16 J	0.07 J	0.04 J	0.17 J	0.02 J	0.42 U
Calcium	185 J	295 J	415	1,230	1,760	8,080	712	560	481	706
Chromium	5	13.8	13.9	9.9	12.3	13.8	10.3	6.3	15	16.7
Cobalt	0.78 J	2.4 J	2.4 J	1.6 J	1.7 J	2 J	1.4 J	1.1 J	1.5 J	1.9 J
Copper	3 B	4.1 B	4.2 B	5.4	8.2	4.4	4.2	5.1	7.1	6.5
Cyanide	0.6 U	0.6 U	1.3	0.6 U	0.55 U	0.55 U	0.55 U	0.5 U	0.55 U	0.55 U
Iron	3,970	9,840	10,300	7,740	6,860	11,000	6,450	5,440	9,450	10,500
Lead	33	18.1	101	57.6	128	27.2	23.3	67.4	34.9	40.2
Magnesium	313 J	669	747	910	1,070	1,060	646	410	812	942
Manganese	19.2 L	57.1 L	41.1 L	95.1	82.9	66.9	58.7	71.2	33.4	55.9
Mercury	0.08 L	0.06 L	0.08 L	0.06 J	0.06 J	0.12 U	0.12 U	0.1 U	0.06 J	0.06 J
Nickel	2.6 J	5.9	7	3.9	3.9	5.9	3.6	2.9 J	4.3	4.8
Potassium	235 J	456 J	589 J	646	575	819	492	356 J	790	867

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Station ID	CAA06-SO11	CAA06-SO12	CAA06-SO13	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID	CAA06-SS11-1108	CAA06-SS12-1108	CAA06-SS13-1108	CAA06-SS14-1108	CAA06-SS15-1108	CAA06-SS16-1108	CAA06-SS17-1108	CAA06-SS18-1108	CAA06-SS19-1108	CAA06-SS19P-1108
Sample Date	11/06/08	11/06/08	11/06/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name										
Selenium	2.8 U	0.44 J	0.38 J	3.1 U	3.4 U	2.7 U	0.31 J	2.6 U	0.35 J	0.37 J
Silver	0.8 U	1 U	0.67 U	0.62 J	0.96 U	0.76 U	0.65 U	0.76 U	0.84 U	0.84 U
Sodium	21.3 B	20.4 B	27.2 B	28.5 J	31.4 J	80.5 J	25.5 J	22.6 J	32.4 J	39.7 J
Thallium	2 U	0.13 B	0.09 B	0.07 J	2.4 U	0.06 J	1.6 U	1.9 U	2.1 U	2.1 U
Vanadium	10.6	22.2	22.5	15.5	16.3	16.9	14	8.9	20.2	23.4
Zinc	9.8 K	19.2 K	25.9 K	51.3	66.2	31.1	22.2	102	23.9	24.1
Wet Chemistry										
% Solids (pct)	78	83	88	79	86	88	84	91	88	89
pH (ph)	4.6	5	5	6	6.2	8.4	5.8	6.4	5	NA
Total organic carbon (TOC) (ug/g)	28,000	26,000	30,000	23,000	20,000	8,700	23,000	11,000	22,000	NA

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO05	CAA06-SO06		CAA06-SO07	CAA06-SO08	CAA06-SO09		CAA06-SO10
Sample ID	CAA06-SB01-1008	CAA06-SB02-1008	CAA06-SB03-1008	CAA06-SB04-1008	CAA06-SB05-1008	CAA06-SB06-1008	CAA06-SB06P-1008	CAA06-SB07-1108	CAA06-SB08-1108	CAA06-SB09-1108	CAA06-SB09P-1108	CAA06-SB10-1108
Sample Date	10/20/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name												
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2,2'-Oxybis(1-chloropropane)	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2,4,5-Trichlorophenol	950 U	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
2,4,6-Trichlorophenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2,4-Dichlorophenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2,4-Dimethylphenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2,4-Dinitrophenol	950 U	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
2,4-Dinitrotoluene	12,000	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U
2,6-Dinitrotoluene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U
2-Chloronaphthalene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2-Chlorophenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2-Methylnaphthalene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2-Methylphenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
2-Nitroaniline	950 U	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
2-Nitrophenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
3,3'-Dichlorobenzidine	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
3-Nitroaniline	950 U	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
4,6-Dinitro-2-methylphenol	950 UJ	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
4-Bromophenyl-phenylether	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
4-Chloro-3-methylphenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
4-Chloroaniline	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
4-Chlorophenyl-phenylether	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
4-Methylphenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
4-Nitroaniline	950 U	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
4-Nitrophenol	950 U	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 R	930 R	920 R	920 R	1,000 R
Acenaphthene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Acenaphthylene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Acetophenone	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Anthracene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Atrazine	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Benzaldehyde	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Benzo(a)anthracene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Benzo(a)pyrene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Benzo(b)fluoranthene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Benzo(g,h,i)perylene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Benzo(k)fluoranthene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
bis(2-Chloroethoxy)methane	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
bis(2-Chloroethyl)ether	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
bis(2-Ethylhexyl)phthalate	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Butylbenzylphthalate	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Caprolactam	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Carbazole	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Chrysene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Dibenz(a,h)anthracene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Dibenzofuran	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Diethylphthalate	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Dimethyl phthalate	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Di-n-butylphthalate	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Di-n-octylphthalate	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Fluoranthene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U

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Station ID	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO05	CAA06-SO06		CAA06-SO07	CAA06-SO08	CAA06-SO09		CAA06-SO10
Sample ID	CAA06-SB01-1008	CAA06-SB02-1008	CAA06-SB03-1008	CAA06-SB04-1008	CAA06-SB05-1008	CAA06-SB06-1008	CAA06-SB06P-1008	CAA06-SB07-1108	CAA06-SB08-1108	CAA06-SB09-1108	CAA06-SB09P-1108	CAA06-SB10-1108
Sample Date	10/20/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name												
Fluorene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Hexachlorobenzene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Hexachlorobutadiene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Hexachlorocyclopentadiene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Hexachloroethane	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Indeno(1,2,3-cd)pyrene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Isophorone	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Naphthalene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
n-Nitroso-di-n-propylamine	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
n-Nitrosodiphenylamine	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Nitrobenzene	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U
Pentachlorophenol	950 UJ	1,100 U	970 U	910 U	890 U	1,000 U	910 U	990 U	930 U	920 U	920 U	1,000 U
Phenanthrene	380 UJ	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Phenol	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Pyrene	380 U	450 U	380 U	360 U	350 U	410 U	360 U	390 U	370 U	360 U	360 U	400 U
Explosives (UG/KG)												
1,3,5-Trinitrobenzene	99 U	100 U	100 U	100 U	100 U	100 U	41 J	100 U	100 U	100 U	100 U	99 U
1,3-Dinitrobenzene	1,600 J	100 UJ	28 J	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U
2,4,6-Trinitrotoluene	2,700,000	6,700	1,400	100 U	100 U	100	100 U	100 U	100 U	100 U	100 U	100
2-Amino-4,6-dinitrotoluene	99 UJ	610 J	650 J	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U
2-Nitrotoluene	200 UJ	200 UJ	200 UJ	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 UJ	100 UJ	100 UJ	99 UJ
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	99 U	100 U	340	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	2,500 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
Nitroguanidine	10 U	10 U	10 U	130 U	120 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	490 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)												
Aluminum	10,400	16,200	23,600	10,400	9,520	12,400	7,480	4,200	9,950	8,540	8,980	15,900
Antimony	10 UL	6.8 UL	11 UL	6 UL	4.4 UL	0.07 L	5.5 UL	4.6 UL	5.8 UL	4.9 UL	4.3 UL	4.6 UL
Arsenic	20.9 J	9.6 J	14.4 J	6.8 J	2.9 J	3.2 J	2.2 J	2 L	4 L	3.3 L	3.4 L	4.9 L
Barium	15.3 J	24.5	35.9	13.5 J	22.4	24.9	18.5	16.4 K	28.8 K	32.6 K	32.8 K	16.1 K
Beryllium	0.73	0.4 J	0.67	0.48 J	0.38	0.42 J	0.27 J	0.37 J	0.34 J	0.48	0.49	0.38 J
Cadmium	0.02 J	0.57 U	0.9 U	0.11 J	0.02 J	0.04 J	0.02 J	0.38 U	0.48 U	0.02 B	0.02 B	0.38 U
Calcium	578	910	1,340	578	126 B	118 J	77.9 J	104 J	1,120	540	440	718
Chromium	34.4 L	23.6 L	36.3 L	19.7 L	11.4 L	12.5 L	8.4 L	5.2	12.5	9.2	9.3	25.8
Cobalt	3.3 J	3.5 J	5 J	2.5 J	1.9 J	2.4 J	1.5 J	2.4 J	1.8 J	2.6 J	2.7 J	3.5 J
Copper	4.3	4.6	8.1	3.9	2.5	29.8 J	4 J	1.5 B	2.7 B	3 B	3.1 B	4.8 B
Cyanide	0.55 U	0.65 U	0.6 U	0.55 U	0.5 U	0.6 U	0.55 U	0.5 U	0.55 U	0.55 U	0.55 U	0.5 U
Iron	34,700 J	15,400 J	25,700 J	17,800 J	7,520 J	9,080 J	5,820 J	3,460	8,260	5,870	6,090	14,800
Lead	25 J	10.8 J	16.6 J	6.9 J	7.1 J	91.7 J	18.1 J	4.1	8.7	30	29	9.4
Magnesium	678 J	933	1,410	776	696	762	544	332 J	591	600	624	939
Manganese	108	31	37.4	26.5	39.4	39.4	32.1	31.8 L	36.9 L	104 L	99.3 L	16.5 L
Mercury	0.11 UL	0.14 UL	0.11 UL	0.1 UL	0.11 UL	0.07 L	0.12 UL	0.12 UL	0.086 UL	0.11 UL	0.11 UL	0.084 UL
Nickel	7.2	8.3	17.2	5.6	5.7	7.6	4.1	3.3	5.2	4.8	5	6.9
Potassium	821	984	1,630	1,010	438	460 J	328 J	203 J	507 J	381 J	410 J	874 J

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Station ID	CAA06-SO01	CAA06-SO02	CAA06-SO03	CAA06-SO04	CAA06-SO05	CAA06-SO06		CAA06-SO07	CAA06-SO08	CAA06-SO09		CAA06-SO10
Sample ID	CAA06-SB01-1008	CAA06-SB02-1008	CAA06-SB03-1008	CAA06-SB04-1008	CAA06-SB05-1008	CAA06-SB06-1008	CAA06-SB06P-1008	CAA06-SB07-1108	CAA06-SB08-1108	CAA06-SB09-1108	CAA06-SB09P-1108	CAA06-SB10-1108
Sample Date	10/20/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	10/21/08	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08
Chemical Name												
Selenium	1.4 J	0.64 J	1.6 J	0.62 J	0.42 J	0.43 J	0.34 J	2.7 U	0.4 J	0.33 J	2.5 U	0.48 J
Silver	1.7 U	1.1 U	1.8 U	1 U	0.74 U	1 U	0.91 U	0.77 U	0.96 U	0.81 U	0.71 U	0.77 U
Sodium	29.5 J	40.9 J	60.6 J	33.8 J	24.2 J	29.8 J	21.5 J	15.2 B	33.2 B	22.1 B	23.6 B	47.6 J
Thallium	4.2 U	2.8 U	4.5 U	0.07 J	1.8 U	2.5 U	2.3 U	1.9 U	0.12 B	2 U	1.8 U	0.22 B
Vanadium	32.6	33.4	54.2	28.3	17.5	19.6	13.5	6.9	19.1	15.2	15.9	30.4
Zinc	24	24.7	34.6	19.7	15.7	55.5 J	15.1 J	7.6 K	16.2 K	14 K	14 K	20.9 K
Wet Chemistry												
% Solids (pct)	87	74	86	91	93	81	92	84	89	90	90	82
pH (ph)	6	5.7	6.1	6.1	4.8	4.7	NA	5.8	6.8	6	NA	6
Total organic carbon (TOC) (ug/g)	2,600 J	3,200 J	2,200 J	2,500 J	7,000 J	15,000 J	NA	4,700	12,000	16,000	NA	3,300

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 6\[2_AOC6_SB_raw.xls], Victoria Brynildsen, 12/02/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA06-SO11	CAA06-SO12	CAA06-SO13	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID	CAA06-SB11-1108	CAA06-SB12-1108	CAA06-SB13-1108	CAA06-SB14-1108	CAA06-SB15-1108	CAA06-SB16-1108	CAA06-SB17-1108	CAA06-SB18-1108	CAA06-SB19-1108	CAA06-SB19P-1108
Sample Date	11/06/08	11/06/08	11/06/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name										
Semivolatile Organic Compounds (UG/KG)										
1,1-Biphenyl	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
2,2'-Oxybis(1-chloropropane)	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
2,4,5-Trichlorophenol	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 R	900 U	890 U
2,4,6-Trichlorophenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
2,4-Dichlorophenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
2,4-Dimethylphenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
2,4-Dinitrophenol	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 R	900 U	890 U
2,4-Dinitrotoluene	100 U	99 U	1,600	100 U	100 U	99 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	99 U	100 U	380 U	370 U	99 UL	360 U	350 U	360 U	350 U
2-Chloronaphthalene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
2-Chlorophenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
2-Methylnaphthalene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
2-Methylphenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
2-Nitroaniline	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 U	900 U	890 U
2-Nitrophenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
3,3'-Dichlorobenzidine	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
3-Nitroaniline	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 U	900 U	890 U
4,6-Dinitro-2-methylphenol	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 R	900 U	890 U
4-Bromophenyl-phenylether	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
4-Chloro-3-methylphenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
4-Chloroaniline	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
4-Chlorophenyl-phenylether	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
4-Methylphenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
4-Nitroaniline	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 U	900 U	890 U
4-Nitrophenol	930 U	1,000 R	930 R	960 U	940 U	950 R	920 U	880 R	900 U	890 U
Acenaphthene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Acenaphthylene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Acetophenone	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Anthracene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Atrazine	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Benzaldehyde	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Benzo(a)anthracene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Benzo(a)pyrene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Benzo(b)fluoranthene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Benzo(g,h,i)perylene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Benzo(k)fluoranthene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
bis(2-Chloroethoxy)methane	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
bis(2-Chloroethyl)ether	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
bis(2-Ethylhexyl)phthalate	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Butylbenzylphthalate	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Caprolactam	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Carbazole	370 U	400 UJ	370 UJ	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Chrysene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Dibenz(a,h)anthracene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Dibenzofuran	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Diethylphthalate	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Dimethyl phthalate	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Di-n-butylphthalate	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Di-n-octylphthalate	370 U	400 U	370 U	380 UJ	370 U	380 R	360 U	350 U	360 U	350 U
Fluoranthene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U

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Station ID	CAA06-SO11	CAA06-SO12	CAA06-SO13	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID	CAA06-SB11-1108	CAA06-SB12-1108	CAA06-SB13-1108	CAA06-SB14-1108	CAA06-SB15-1108	CAA06-SB16-1108	CAA06-SB17-1108	CAA06-SB18-1108	CAA06-SB19-1108	CAA06-SB19P-1108
Sample Date	11/06/08	11/06/08	11/06/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name										
Fluorene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Hexachlorobenzene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Hexachlorobutadiene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Hexachlorocyclopentadiene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Hexachloroethane	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Indeno(1,2,3-cd)pyrene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Isophorone	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Naphthalene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
n-Nitroso-di-n-propylamine	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
n-Nitrosodiphenylamine	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Nitrobenzene	100 U	99 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U
Pentachlorophenol	930 U	1,000 U	930 U	960 U	940 U	950 R	920 U	880 R	900 U	890 U
Phenanthrene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Phenol	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 R	360 U	350 U
Pyrene	370 U	400 U	370 U	380 U	370 U	380 R	360 U	350 U	360 U	350 U
Explosives (UG/KG)										
1,3,5-Trinitrobenzene	100 U	99 U	100 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 U	99 U	290	100 U	100 U	99 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	99 U	660,000	100 U	100 U	99 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	99 U	15,000	100 U	100 U	99 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	100 U	99 U	550	100 U	100 U	99 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	99 U	30,000	100 U	100 U	99 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U	5,000 U
Nitroguanidine	120 U	120 U	130 U	130 U	120 U	130 U	120 U	130 U	120 U	130 U
PETN	500 U	490 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)										
Aluminum	5,140	6,360	13,400	9,530	12,700	13,200	12,700	5,770	11,200	11,100
Antimony	5.1 UL	5.8 UL	4.2 UL	0.1 L	0.16 L	0.16 L	0.16 L	4.9 UL	0.08 L	0.11 L
Arsenic	1.8 L	4 L	5.4 L	4.1	5	4.2	2.6	2.2	3.8	3.4
Barium	15.2 K	21.3 K	25.4 K	44.5	37.8	27.4	32.7	31.1	42.5	41.9
Beryllium	0.24 J	0.38 J	0.42	0.45	0.48	0.35 J	0.31	0.23 J	0.47	0.42
Cadmium	0.42 U	0.48 U	0.35 U	0.03 J	0.04 J	0.44 U	0.28 U	0.08 J	0.04 J	0.02 J
Calcium	83 J	114 J	482	1,310	1,840	12,600	921	626	3,700	3,530
Chromium	5.7	8	16.3	12.6	20	16.6	14.7	8.4	18.3	19
Cobalt	0.99 J	1.5 J	2.6 J	1.8 J	2.4 J	1.9 J	1.4 J	0.95 J	2.1 J	1.9 J
Copper	4.5 B	1.8 B	4.8 B	4.6	5.2	2.8	3.7	4.2	6.2	5.5
Cyanide	0.55 U	0.55 U	0.54 J	0.55 U	0.5 U	0.55 U	0.5 U	0.5 U	0.55 U	0.5 U
Iron	4,130	6,860	11,900	9,960	12,700	11,900	9,900	5,800	12,000	11,100
Lead	10.2	5.6	35.4	19.3	60	9.6	7.6	20.1	19.8	22.9
Magnesium	366 J	479 J	855	840	1,120	1,140	732	432	1,150	1,040
Manganese	20.7 L	28.8 L	39.4 L	104	86.3	29	30.4	44.8	58.8	62.9
Mercury	0.11 UL	0.11 UL	0.05 L	0.11 U	0.11 U	0.12 U	0.11 U	0.11 U	0.04 J	0.11 U
Nickel	2.8 J	3.8	7	4.2	6.4	5.3	3.9	2.8 J	6.2	6.7
Potassium	218 J	290 J	687 J	621	1,030	960	409	342 J	781	765

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Station ID	CAA06-SO11	CAA06-SO12	CAA06-SO13	CAA06-SO14	CAA06-SO15	CAA06-SO16	CAA06-SO17	CAA06-SO18	CAA06-SO19	
Sample ID	CAA06-SB11-1108	CAA06-SB12-1108	CAA06-SB13-1108	CAA06-SB14-1108	CAA06-SB15-1108	CAA06-SB16-1108	CAA06-SB17-1108	CAA06-SB18-1108	CAA06-SB19-1108	CAA06-SB19P-1108
Sample Date	11/06/08	11/06/08	11/06/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name										
Selenium	3 U	3.4 U	0.41 J	2.7 U	2.9 U	3.1 U	0.33 J	2.9 U	3.2 U	2 U
Silver	0.85 U	0.96 U	0.69 U	0.76 U	0.82 U	0.88 U	0.56 U	0.82 U	0.9 U	0.57 U
Sodium	13 B	18.9 B	25.8 B	29.9 J	33.4 J	119 J	27.8 J	20.5 J	50.3 J	49.6 J
Thallium	2.1 U	2.4 U	0.11 B	1.9 U	2 U	0.08 J	1.4 U	2.1 U	2.2 U	1.4 U
Vanadium	9.2	16.7	23.9	18	25.4	23.2	22.2	11.6	21.6	20.4
Zinc	9.7 K	11.3 K	20.8 K	21.6	26.9	12.9	9.8	51.1	20.6	19.7
Wet Chemistry										
% Solids (pct)	89	82	89	87	88	87	90	94	92	93
pH (ph)	5.1	5.1	5.3	8.1	8.5	7.2	6.2	6.1	7.2	NA
Total organic carbon (TOC) (ug/g)	7,300	5,200	5,600	14,000	3,400	1,700	3,700	5,800	20,000	NA

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA06-DW01	CAA06-DW02	CAA06-DW03	CAA06-DW04		CAA06-DW05	CAA06-DW06	CAA06-DW07	CAA06-DW08	CAA06-DW09	CAA06-DW10		CAA06-DW11
Sample ID	CAA06-DW01-1108	CAA06-DW02-1108	CAA06-DW03-1108	CAA06-DW04-1108	CAA06-DW04P-1108	CAA06-DW05-1108	CAA06-DW06-1108	CAA06-DW07-1108	CAA06-DW08-1108	CAA06-DW09-1108	CAA06-DW10-1108	CAA06-DW10P1108	CAA06-DW11-1108
Sample Date	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08	11/10/08	11/10/08	11/10/08	11/10/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name													
Semivolatile Organic Compounds (UG/L)													
1,1-Biphenyl	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2,2'-Oxybis(1-chloropropane)	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2,4,5-Trichlorophenol	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
2,4,6-Trichlorophenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2,4-Dichlorophenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2,4-Dimethylphenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2,4-Dinitrophenol	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
2,4-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,6-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Chloronaphthalene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2-Chlorophenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2-Methylnaphthalene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2-Methylphenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
2-Nitroaniline	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
2-Nitrophenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
3,3'-Dichlorobenzidine	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
3-Nitroaniline	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
4,6-Dinitro-2-methylphenol	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
4-Bromophenyl-phenylether	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
4-Chloro-3-methylphenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
4-Chloroaniline	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
4-Chlorophenyl-phenylether	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
4-Methylphenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
4-Nitroaniline	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
4-Nitrophenol	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 R	24 R	24 R	24 R
Acenaphthene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Acenaphthylene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Acetophenone	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Anthracene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Atrazine	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Benzaldehyde	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Benzo(a)anthracene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Benzo(a)pyrene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Benzo(b)fluoranthene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Benzo(g,h,i)perylene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Benzo(k)fluoranthene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
bis(2-Chloroethoxy)methane	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
bis(2-Chloroethyl)ether	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
bis(2-Ethylhexyl)phthalate	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Butylbenzylphthalate	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Caprolactam	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Carbazole	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Chrysene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Dibenz(a,h)anthracene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Dibenzofuran	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Diethylphthalate	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Dimethyl phthalate	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Di-n-butylphthalate	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Di-n-octylphthalate	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Fluoranthene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Fluorene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Hexachlorobenzene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Hexachlorobutadiene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Hexachlorocyclopentadiene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Hexachloroethane	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Indeno(1,2,3-cd)pyrene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Isophorone	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Naphthalene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
n-Nitroso-di-n-propylamine	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U

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Station ID	CAA06-DW01	CAA06-DW02	CAA06-DW03	CAA06-DW04		CAA06-DW05	CAA06-DW06	CAA06-DW07	CAA06-DW08	CAA06-DW09	CAA06-DW10		CAA06-DW11
Sample ID	CAA06-DW01-1108	CAA06-DW02-1108	CAA06-DW03-1108	CAA06-DW04-1108	CAA06-DW04P-1108	CAA06-DW05-1108	CAA06-DW06-1108	CAA06-DW07-1108	CAA06-DW08-1108	CAA06-DW09-1108	CAA06-DW10-1108	CAA06-DW10P1108	CAA06-DW11-1108
Sample Date	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08	11/10/08	11/10/08	11/10/08	11/10/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name													
n-Nitrosodiphenylamine	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Nitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Pentachlorophenol	30 U	24 U	24 U	25 U	25 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U	24 U
Phenanthrene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Phenol	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Pyrene	12 U	10 U	10 U	10 U	10 U	9 U	9 U	10 U	10 U	9 U	9 U	9 U	9 U
Explosives (UG/L)													
1,3,5-Trinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Amino-4,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
3,5-Dinitroaniline	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
3-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
4-Amino-2,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
HMX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
PETN	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
RDX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Tetryl	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Total Metals (UG/L)													
Aluminum	2,170	16,800	3,860	1,980	2,860	74,900	30,600	35,100	1,730	57,600	14,600 J	1,810 J	12,100
Antimony	60 R	60 R	60 R	60 R	60 R	60 U	60 U	0.78 J	60 U	8.8 J	3.8 J	60 U	3.6 J
Arsenic	76.2	47.4	25.3	4.8 B	6.8 B	123	83.2	163	36.5	134	53.1 J	11.4 J	24.6
Barium	20.2 J	20.4 J	14.4 J	29.5 J	31.6 J	151 J	50 J	89.1 J	13 J	208	87.1 J	48.7 J	68.5 J
Beryllium	0.29 J	2 J	0.66 J	0.24 J	0.45 J	5.6	2.7 J	4.8 J	5 U	4.1 J	1 J	0.18 J	0.8 J
Cadmium	0.47 B	1.7 J	1 J	0.34 B	0.33 J	10.8	0.05 B	0.39 B	5 U	5	1.4 J	0.18 J	0.57 J
Calcium	46,800	41,300	35,300	25,600	25,500	30,100	39,400	56,100	45,200	661,000	278,000	165,000	357,000
Chromium	8.6 B	42.5	9.3 J	5.8 J	7.7 J	198	149	152	5 J	250	59	7.2 J	84.8
Cobalt	6 J	25.5 J	7.8 J	28.1 J	30.4 J	43.1 J	13.7 J	22.2 J	0.53 J	23.3 J	7 J	1 J	6 J
Copper	7.4 B	17 B	8.4 B	8.2 B	8.1 B	62.9	44.4	43.4	6 J	60.2	23.1 J	9.8 J	26
Cyanide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron	34,000	126,000	65,300	6,180	8,730	202,000	126,000	230,000	24,800	116,000	32,100 J	5,090 J	27,800
Lead	4.7 B	22.3	5.6 J	3.6 J	4.4 J	93.9	70.2	71.8	3.3 J	50.1	14.6	2.5 J	11.9
Magnesium	2,890 J	5,770	4,060 J	6,720	6,620	8,580	5,810	7,260	2,870 J	20,700	6,770	2,840 J	5,510
Manganese	239	1,070	320	3,000	2,970	573	368	701	457	424	109 J	23.5 J	123
Mercury	0.2 U	0.04 J	0.2 U	0.2 U	0.2 U	0.07 J	0.03 J	0.04 J	0.2 U	0.04 L	0.2 UL	0.2 UL	0.2 UL
Nickel	5.3 B	53.8	11.6 J	12.1 J	14.4 J	91.6	61.6	62.5	3.4 B	86.7	26.5 J	4.7 J	43.9
Potassium	3,170 J	4,610 J	2,070 J	1,230 J	1,320 J	8,490	8,020	9,130	2,930 J	23,000	9,220	4,410 J	5,660
Selenium	35 U	35 U	35 U	35 U	35 U	35 U	35 U	2.1 J	35 U	5.8 J	5.5 J	35 U	35 U
Silver	0.4 B	1.2 B	0.52 B	0.59 B	0.91 B	3 J	2.2 J	5 J	0.77 J	10 U	10 U	10 U	10 U
Sodium	11,200	11,100	11,400	17,200	16,800	10,800	10,600	11,200	11,700	24,200	14,200	12,400	7,330
Thallium	2.5 B	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	2.1 J	25 U	1.7 J	2.2 J
Vanadium	8.1 J	52.3	10.3 J	3.7 J	5.1 J	184	107	155	3.6 J	325	85.5	9.6 J	52
Zinc	15.1 B	160	48.4 J	20 J	27.4 J	376	205	194	8.9 J	227	60.7	10.3 J	60.2
Dissolved Metals (UG/L)													
Aluminum, Dissolved	127 J	59.8 B	115 B	45.6 B	39.5 B	3,540	68.5 B	4,080	71.4 B	385	227	242	250
Antimony, Dissolved	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U	60 U
Arsenic, Dissolved	74.6	17.5	18.4	2.9 J	10 U	43.3	38.5	62.2	35.4	4.6 B	4.5 B	3.6 B	3.3 B
Barium, Dissolved	16.1 J	4.2 J	4 J	25.9 J	22.8 J	20.5 J	8.2 J	27.4 J	9.6 J	50 J	46.5 J	46.4 J	31.1 J
Beryllium, Dissolved	5 U	5 U	5 U	5 U	5 U	0.28 J	5 U	0.63 J	5 U	5 U	5 U	5 U	5 U
Cadmium, Dissolved	0.32 B	0.38 B	0.6 B	0.2 B	0.18 B	0.35 B	5 U	5 U	5 U	5 U	0.09 B	5 U	0.07 B
Calcium, Dissolved	48,900	41,800	33,700	28,400	23,400	29,400	40,600	54,100	46,700	192,000	166,000	166,000	142,000
Chromium, Dissolved	10 U	10 U	10 U	10 U	10 U	8.8 J	10 U	17.1	10 U	0.95 J	10 U	10 U	0.58 B
Cobalt, Dissolved	1.8 J	5.7 J	50 U	22.8 J	25.2 J	7 J	0.97 J	2.4 J	50 U	0.92 B	0.66 B	0.7 B	0.56 B
Copper, Dissolved	25 U	25 U	25 U	1 B	25 U	8.5 J	25 U	9.9 J	25 U	1.3 J	1.4 J	1.2 J	1.2 J

Cheatham Annex
AOC 6
Groundwater Data Raw Analytical Results
December 2010

Station ID	CAA06-DW01	CAA06-DW02	CAA06-DW03	CAA06-DW04		CAA06-DW05	CAA06-DW06	CAA06-DW07	CAA06-DW08	CAA06-DW09	CAA06-DW10		CAA06-DW11
Sample ID	CAA06-DW01-1108	CAA06-DW02-1108	CAA06-DW03-1108	CAA06-DW04-1108	CAA06-DW04P-1108	CAA06-DW05-1108	CAA06-DW06-1108	CAA06-DW07-1108	CAA06-DW08-1108	CAA06-DW09-1108	CAA06-DW10-1108	CAA06-DW10P1108	CAA06-DW11-1108
Sample Date	11/05/08	11/06/08	11/06/08	11/06/08	11/06/08	11/10/08	11/10/08	11/10/08	11/10/08	11/11/08	11/11/08	11/11/08	11/11/08
Chemical Name													
Iron, Dissolved	25,400	42,500	51,400	846	1,100	50,100	19,500	46,500	23,100	336	39.6 B	18.2 B	502
Lead, Dissolved	1 J	1.7 J	1.4 J	1.3 J	10 U	4.7 J	10 U	9.8 J	10 U	2.2 J	2.4 J	1.2 J	1.3 J
Magnesium, Dissolved	2,780 J	4,140 J	3,460 J	7,070	6,570	3,020 J	2,290 J	3,480 J	2,810 J	3,010 J	2,460 J	2,430 J	1,580 J
Manganese, Dissolved	237	983	249	3,150	3,170	391	259	480	467	30.5	23.3	24.1	17.7
Mercury, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel, Dissolved	2.4 B	7.6 J	40 U	6.2 J	7.5 J	7.7 J	4.3 J	8.5 J	1.1 B	7.1 J	5.8 J	6.1 J	6.1 J
Potassium, Dissolved	3,040 J	2,220 J	1,340 J	1,140 J	994 J	2,240 J	2,830 J	3,920 J	2,690 J	2,950 J	3,770 J	3,780 J	912 J
Selenium, Dissolved	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U	35 U
Silver, Dissolved	0.6 B	0.73 B	0.76 B	0.66 B	0.58 B	1 J	0.76 J	1.2 J	0.8 J	10 U	10 U	10 U	10 U
Sodium, Dissolved	11,100	11,200	11,300	17,400	18,500	11,800	11,400	11,200	12,200	21,600	13,300	13,300	5,860
Thallium, Dissolved	1.8 B	2.1 B	1.8 B	25 U	25 U	25 U	25 U	1.7 J	25 U	2 J	25 U	25 U	25 U
Vanadium, Dissolved	50 U	50 U	0.53 J	50 U	50 U	8.2 J	50 U	17.2 J	50 U	0.9 J	50 U	50 U	50 U
Zinc, Dissolved	5 B	15.4 J	2.2 B	4.7 J	13.4 J	24.3 J	6 J	26.2 J	5.1 J	3.2 J	3 J	2.9 J	4 J

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

Cheatham Annex
AOC 6
Surface Water Data Raw Analytical Results
December 2010

Station ID	CAA06-SW01		CAA06-SW02
Sample ID	CAA06-SW01-1008	CAA06-SW01P-1008	CAA06-SW02-1008
Sample Date	10/23/08	10/23/08	10/23/08
Chemical Name			
Semivolatile Organic Compounds (UG/L)			
1,1-Biphenyl	10 U	10 U	10 U
2,2'-Oxybis(1-chloropropane)	10 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U
2,4,6-Trichlorophenol	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U
2,4-Dinitrophenol	25 U	25 U	25 U
2,4-Dinitrotoluene	0.2 U	0.2 U	0.2 U
2,6-Dinitrotoluene	0.2 U	0.2 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U
2-Nitrophenol	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U
4-Bromophenyl-phenylether	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U
4-Nitrophenol	25 UJ	25 UJ	25 UJ
Acenaphthene	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U
Acetophenone	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U
Atrazine	10 U	10 U	10 U
Benzaldehyde	10 UJ	10 UJ	10 UJ
Benzo(a)anthracene	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	2.1 J	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U
Caprolactam	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U
Dimethyl phthalate	10 U	10 U	10 U
Di-n-butylphthalate	10 U	10 U	10 U
Di-n-octylphthalate	10 U	10 U	2.2 J
Fluoranthene	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U
n-Nitroso-di-n-propylamine	10 U	10 U	10 U

Cheatham Annex
AOC 6
Surface Water Data Raw Analytical Results
December 2010

Station ID	CAA06-SW01		CAA06-SW02
Sample ID	CAA06-SW01-1008	CAA06-SW01P-1008	CAA06-SW02-1008
Sample Date	10/23/08	10/23/08	10/23/08
Chemical Name			
n-Nitrosodiphenylamine	10 U	10 U	10 U
Nitrobenzene	0.2 U	0.2 U	0.2 U
Pentachlorophenol	25 U	25 U	25 U
Phenanthrene	10 U	10 U	10 U
Phenol	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U
Explosives (UG/L)			
1,3,5-Trinitrobenzene	0.2 U	0.2 U	0.2 U
1,3-Dinitrobenzene	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	0.2 U	0.2 U	0.2 U
2-Amino-4,6-dinitrotoluene	0.2 U	0.2 U	0.2 U
2-Nitrotoluene	0.4 U	0.4 U	0.4 U
3,5-Dinitroaniline	0.2 U	0.2 U	0.2 UL
3-Nitrotoluene	0.4 U	0.4 U	0.4 U
4-Amino-2,6-dinitrotoluene	0.2 U	0.2 U	0.2 U
4-Nitrotoluene	0.4 U	0.4 U	0.4 U
HMX	0.4 U	0.4 U	0.4 U
Nitroglycerin	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U
PETN	1 U	1 U	1 U
RDX	0.16 J	0.4 U	0.4 U
Tetryl	0.4 U	0.4 U	0.4 U
Total Metals (UG/L)			
Aluminum	71.6 B	53.5 B	110 B
Antimony	60 U	60 U	60 U
Arsenic	8.8 B	8.7 B	8.5 B
Barium	19.6 J	19 J	19.8 J
Beryllium	5 U	5 U	5 U
Cadmium	0.17 B	0.14 B	0.1 B
Calcium	30,800	30,800	31,500
Chromium	10 U	10 U	10 U
Cobalt	50 U	50 U	50 U
Copper	25 U	25 U	25 U
Cyanide	10 U	10 U	10 U
Iron	240	241	279
Lead	10 U	10 U	10 U
Magnesium	1,870 J	1,860 J	1,900 J
Manganese	37.4	37.1	38.6
Mercury	0.2 UL	0.2 UL	0.2 UL
Nickel	0.42 B	0.56 B	0.54 B
Potassium	2,880 J	2,840 J	2,990 J
Selenium	35 U	35 U	35 U
Silver	10 U	10 U	10 U
Sodium	11,500	11,700	11,900
Thallium	1.7 J	25 U	25 U
Vanadium	50 U	50 U	0.41 J
Zinc	3.4 J	3 J	3.4 J
Dissolved Metals (UG/L)			
Aluminum, Dissolved	55.4 J	36 J	52.8 J
Antimony, Dissolved	60 U	60 U	60 U
Arsenic, Dissolved	8.4 B	8.3 B	8.2 B
Barium, Dissolved	17.5 J	17.8 J	15.9 J
Beryllium, Dissolved	5 U	5 U	5 U
Cadmium, Dissolved	0.11 B	0.12 B	0.06 B
Calcium, Dissolved	30,500	30,700	29,700
Chromium, Dissolved	10 U	10 U	10 U
Cobalt, Dissolved	50 U	50 U	50 U
Copper, Dissolved	25 U	25 U	0.78 J

Cheatham Annex
AOC 6
Surface Water Data Raw Analytical Results
December 2010

Station ID	CAA06-SW01		CAA06-SW02
Sample ID	CAA06-SW01-1008	CAA06-SW01P-1008	CAA06-SW02-1008
Sample Date	10/23/08	10/23/08	10/23/08
Chemical Name			
Iron, Dissolved	35.4 J	31.8 J	34.3 J
Lead, Dissolved	10 U	10 U	10 U
Magnesium, Dissolved	1,830 J	1,850 J	1,760 J
Manganese, Dissolved	15 U	15 U	15 U
Mercury, Dissolved	0.2 UL	0.2 UL	0.2 UL
Nickel, Dissolved	0.52 J	0.6 J	0.45 J
Potassium, Dissolved	2,720 J	2,800 J	2,700 J
Selenium, Dissolved	35 U	35 U	35 U
Silver, Dissolved	10 U	10 U	10 U
Sodium, Dissolved	11,700	11,800	11,700
Thallium, Dissolved	25 U	25 U	25 U
Vanadium, Dissolved	50 U	0.46 J	0.41 J
Zinc, Dissolved	2.8 J	2.9 J	2.4 J
Wet Chemistry			
Hardness (ug/l)	84,600	NA	86,400

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

Cheatham Annex
AOC 6
Sediment Data Raw Analytical Results
December 2010

Station ID	CAA06-SD01			CAA06-SD02	
Sample ID	CAA06-SD01-1008	CAA06-SD01P-1008	CAA06-SSD01-1008	CAA06-SD02-1008	CAA06-SSD02-1008
Sample Date	10/23/08	10/23/08	10/23/08	10/23/08	10/23/08
Chemical Name					
Semivolatile Organic Compounds (UG/KG)					
1,1-Biphenyl	1,200 U	480 U	680 U	480 U	600 U
2,2'-Oxybis(1-chloropropane)	1,200 U	480 U	680 U	480 U	600 U
2,4,5-Trichlorophenol	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
2,4,6-Trichlorophenol	1,200 U	480 U	680 U	480 U	600 U
2,4-Dichlorophenol	1,200 U	480 U	680 U	480 U	600 U
2,4-Dimethylphenol	1,200 U	480 U	680 U	480 U	600 U
2,4-Dinitrophenol	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
2,4-Dinitrotoluene	99 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	99 U	100 U	100 U	100 U	260
2-Chloronaphthalene	1,200 U	480 U	680 U	480 U	600 U
2-Chlorophenol	1,200 U	480 U	680 U	480 U	600 U
2-Methylnaphthalene	1,200 U	480 U	680 U	480 U	600 U
2-Methylphenol	1,200 U	480 U	680 U	480 U	600 U
2-Nitroaniline	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
2-Nitrophenol	1,200 U	480 U	680 U	480 U	600 U
3,3'-Dichlorobenzidine	1,200 U	480 U	680 U	480 U	600 U
3-Nitroaniline	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
4,6-Dinitro-2-methylphenol	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
4-Bromophenyl-phenylether	1,200 U	480 U	680 U	480 U	600 U
4-Chloro-3-methylphenol	1,200 U	480 U	680 U	480 U	600 U
4-Chloroaniline	1,200 U	480 U	680 U	480 U	600 U
4-Chlorophenyl-phenylether	1,200 U	480 U	680 U	480 U	600 U
4-Methylphenol	1,200 U	480 U	680 U	480 U	600 U
4-Nitroaniline	3,000 U	1,200 U	1,700 U	1,200 U	1,500 R
4-Nitrophenol	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
Acenaphthene	1,200 U	480 U	680 U	480 U	600 U
Acenaphthylene	1,200 U	480 U	680 U	480 U	600 U
Acetophenone	1,200 U	480 U	680 U	480 U	600 U
Anthracene	1,200 U	480 U	680 U	480 U	600 U
Atrazine	1,200 U	480 U	680 U	480 U	600 U
Benzaldehyde	1,200 U	480 U	680 U	480 U	600 U
Benzo(a)anthracene	1,200 U	480 U	680 U	480 U	600 U
Benzo(a)pyrene	1,200 U	480 UJ	680 U	480 U	600 U
Benzo(b)fluoranthene	1,200 U	480 UJ	680 U	480 U	600 U
Benzo(g,h,i)perylene	1,200 U	480 UJ	680 U	480 U	600 U
Benzo(k)fluoranthene	1,200 U	480 UJ	680 U	480 U	600 U
bis(2-Chloroethoxy)methane	1,200 U	480 U	680 U	480 U	600 U
bis(2-Chloroethyl)ether	1,200 U	480 U	680 U	480 U	600 U
bis(2-Ethylhexyl)phthalate	3,300 J	480 UJ	680 U	480 U	600 U
Butylbenzylphthalate	1,200 U	480 U	680 U	480 U	600 U
Caprolactam	1,200 U	480 U	680 U	480 U	600 U
Carbazole	1,200 U	480 U	680 U	480 U	600 U
Chrysene	1,200 U	480 U	680 U	480 U	600 U
Dibenz(a,h)anthracene	1,200 U	480 UJ	680 U	480 U	600 U
Dibenzofuran	1,200 U	480 U	680 U	480 U	600 U
Diethylphthalate	1,200 U	480 U	680 U	480 U	600 U
Dimethyl phthalate	1,200 U	480 U	680 U	480 U	600 U
Di-n-butylphthalate	1,200 U	480 U	680 U	480 U	600 U
Di-n-octylphthalate	2,500 J	480 UJ	680 UJ	480 UJ	600 UJ
Fluoranthene	1,200 U	480 U	680 U	480 U	600 U
Fluorene	1,200 U	480 U	680 U	480 U	600 U
Hexachlorobenzene	1,200 U	480 U	680 U	480 U	600 U
Hexachlorobutadiene	1,200 U	480 U	680 U	480 U	600 U
Hexachlorocyclopentadiene	1,200 U	480 U	680 U	480 U	600 U
Hexachloroethane	1,200 U	480 U	680 U	480 U	600 U
Indeno(1,2,3-cd)pyrene	1,200 U	480 UJ	680 U	480 U	600 U
Isophorone	1,200 U	480 U	680 U	480 U	600 U
Naphthalene	1,200 U	480 U	680 U	480 U	600 U
n-Nitroso-di-n-propylamine	1,200 U	480 U	680 U	480 U	600 U

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Station ID	CAA06-SD01			CAA06-SD02	
Sample ID	CAA06-SD01-1008	CAA06-SD01P-1008	CAA06-SSD01-1008	CAA06-SD02-1008	CAA06-SSD02-1008
Sample Date	10/23/08	10/23/08	10/23/08	10/23/08	10/23/08
Chemical Name					
n-Nitrosodiphenylamine	1,200 U	480 U	680 U	480 U	600 U
Nitrobenzene	99 U	100 U	100 U	100 U	100 U
Pentachlorophenol	3,000 U	1,200 U	1,700 U	1,200 U	1,500 U
Phenanthrene	1,200 U	480 U	680 U	480 U	600 U
Phenol	1,200 U	480 U	680 U	480 U	600 U
Pyrene	1,200 U	480 U	680 U	480 U	600 U
Explosives (UG/KG)					
1,3,5-Trinitrobenzene	99 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	99 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	99 U	100 U	100 U	100 U	150
2-Amino-4,6-dinitrotoluene	99 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	99 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	99 U	110	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	2,500 U	2,500 UJ	2,500 U	2,500 R	2,500 R
Nitroguanidine	120 U	120 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)					
Aluminum	2,200 J	626 J	1,690	1,460	5,760
Antimony	0.17 L	0.06 L	0.18 L	4.8 UL	4.8 UL
Arsenic	12.1 J	3.7 J	6.9 J	1.2 J	4.6 J
Barium	9.4 J	2.9 J	8.3 J	4.1 J	16.4
Beryllium	0.18 J	0.06 J	0.12 J	0.07 J	0.19 J
Cadmium	0.07 B	0.37 U	0.03 B	0.02 B	0.05 B
Calcium	1,680 J	510 J	2,780	614	2,960
Chromium	5 J	1.8 J	2.9 J	2.9 J	7.6 J
Cobalt	0.67 J	0.2 J	0.49 J	0.35 J	1.2 J
Copper	3.5 B	0.98 B	2.7	1.3 B	4
Cyanide	1.8 U	0.7 U	1 U	0.65 U	0.8 U
Iron	4,840 J	1,920 J	3,610 J	1,820 J	4,740 J
Lead	11 J	6.8 J	6.4 J	2.9 J	11.5 J
Magnesium	206 J	59.2 J	174 J	109 J	416
Manganese	37.1	13.6	38.1	15.2	53.2
Mercury	0.36 UL	0.13 UL	0.2 UL	0.15 UL	0.17 UL
Nickel	1.7 J	0.56 J	1.3 J	0.88 J	3.3
Potassium	195 J	68.7 J	137 J	99 J	293 J
Selenium	7.2 UL	2.6 UL	3.5 UL	2.8 UL	2.8 UL
Silver	2.1 U	0.74 U	1 U	0.81 U	0.81 U
Sodium	29.2 J	7.8 J	28.6 J	10.7 J	38.4 J
Thallium	5.2 U	1.9 U	2.5 U	2 U	2 U
Vanadium	5.9 J	2.2 J	4.4 J	3.8 J	10.2 J
Zinc	12.1	3.5 J	10	6.9	28.9
Acid Volatile Sulfide/Simultaneously Extractable Metals (MG/KG)					
Cadmium, SEM	7.90E-04 J	1.80E-04 J	3.20E-04 J	1.10E-04 J	3.40E-04 J
Copper, SEM	0.0250 L	0.0101 L	0.0121 L	0.00536 B	0.0124 L
Lead, SEM	0.0420 J	0.0109 J	0.0229	0.00871	0.0216
Mercury, SEM	7.00E-05 R	2.81E-05 R	4.10E-05 R	2.93E-05 R	3.65E-05 R
Nickel, SEM	0.0093 J	0.00248 B	0.00313 B	0.00139 B	0.00368 B
Zinc, SEM	0.204 J	0.0388 J	0.0645	0.0277	0.0863
AVSSEM (UMOL/G)					
Acid volatile sulfide	13 L	1.4 L	5.1 L	0.15 UL	3 L
Wet Chemistry					

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Station ID	CAA06-SD01			CAA06-SD02	
Sample ID	CAA06-SD01-1008	CAA06-SD01P-1008	CAA06-SSD01-1008	CAA06-SD02-1008	CAA06-SSD02-1008
Sample Date	10/23/08	10/23/08	10/23/08	10/23/08	10/23/08
Chemical Name					
% Solids (pct)	28	69	48	68	55
pH (ph)	7.6	NA	7.4	7.8	7.3
Total organic carbon (TOC) (ug/g)	69,000 K	NA	36,000 K	23,000 K	31,000 K
Grain Size (PCT)					
Coarse Sand (%)	2.3	NA	2.2	1.4	4.7
Fine Sand (%)	34.2	NA	57.1	44.8	48.8
Fines (%)	48.6	NA	19.9	16.8	0.4
Gravel (%)	4.3	NA	3.7	2.9	6.3
GS03 Sieve 3" (75 mm)	100	NA	100	100	100
GS05 Sieve 2" (50 mm)	100	NA	100	100	100
GS06 Sieve 1.5" (37.5 mm)	100	NA	100	100	100
GS07 Sieve 1" (25.0 mm)	100	NA	100	100	100
GS08 Sieve 0.75" (19.0 mm)	100	NA	100	99.4	100
GS10 Sieve 0.375" (9.5 mm)	97.9	NA	98.6	98.8	97.2
Medium Sand (%)	10.6	NA	17.1	34	39.7
Sieve No. 004 (4.75 mm)	95.7	NA	96.3	97.1	93.7
Sieve No. 010 (2.00 mm)	93.4	NA	94.1	95.7	89
Sieve No. 020 (850 um)	91.7	NA	92	90.7	81.4
Sieve No. 040 (425 um)	82.8	NA	76.9	61.7	49.3
Sieve No. 060 (250 um)	67.2	NA	52.9	35	23
Sieve No. 100 (150 um)	56.5	NA	33.8	24.5	12.4
Sieve No. 140 (106 um)	59.9	NA	40.2	27.4	15.5
Sieve No. 200 (75 um)	48.6	NA	19.9	16.8	0.4

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 6\[5_AOC6_SD_raw.xls], Victoria Brynildsen, 12/02/2010

Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID	CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008	CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/31/08	10/31/08
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,1,2,2-Tetrachloroethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,1,2-Trichloroethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,1-Dichloroethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,1-Dichloroethene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2,4-Trichlorobenzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2-Dibromo-3-chloropropane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2-Dibromoethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2-Dichlorobenzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2-Dichloroethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2-Dichloroethene (total)	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,2-Dichloropropane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,3-Dichlorobenzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
1,4-Dichlorobenzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
2-Butanone	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
2-Hexanone	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
4-Methyl-2-pentanone	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Acetone	4 B	4 B	4 B	11 U	12 U	4 B	11 U	3 B
Benzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Bromodichloromethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Bromoform	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Bromomethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Carbon disulfide	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Carbon tetrachloride	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Chlorobenzene	12 U	13 U	11 U	11 U	12 U	12 UJ	11 U	11 U
Chloroethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Chloroform	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Chloromethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
cis-1,2-Dichloroethene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
cis-1,3-Dichloropropene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Cyclohexane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Dibromochloromethane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Dichlorodifluoromethane (Freon-12)	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Ethylbenzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Isopropylbenzene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
m- and p-Xylene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Methyl acetate	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Methylcyclohexane	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Methylene chloride	7 B	11 B	8 B	5 B	1 B	1 B	3 B	2 B
Methyl-tert-butyl ether (MTBE)	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
o-Xylene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Styrene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Tetrachloroethene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Toluene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
trans-1,2-Dichloroethene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
trans-1,3-Dichloropropene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Trichloroethene	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Trichlorofluoromethane(Freon-11)	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Vinyl chloride	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Xylene, total	12 U	13 U	11 U	11 U	12 U	12 U	11 U	11 U
Semivolatile Organic Compounds (UG/KG)								
1,1-Biphenyl	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2,2'-Oxybis(1-chloropropane)	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2,4,5-Trichlorophenol	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
2,4,6-Trichlorophenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2,4-Dichlorophenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2,4-Dimethylphenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID	CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008	CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/31/08	10/31/08
Chemical Name								
2,4-Dinitrophenol	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Chloronaphthalene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2-Chlorophenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2-Methylnaphthalene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2-Methylphenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
2-Nitroaniline	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
2-Nitrophenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
3,3'-Dichlorobenzidine	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
3-Nitroaniline	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
4,6-Dinitro-2-methylphenol	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
4-Bromophenyl-phenylether	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
4-Chloro-3-methylphenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
4-Chloroaniline	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
4-Chlorophenyl-phenylether	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
4-Methylphenol	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
4-Nitroaniline	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
4-Nitrophenol	980 R	3,100 R	940 R	930 R	960 U	980 U	920 R	960 R
Acenaphthene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Acenaphthylene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Acetophenone	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Anthracene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Atrazine	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Benzaldehyde	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Benzo(a)anthracene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Benzo(a)pyrene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Benzo(b)fluoranthene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Benzo(g,h,i)perylene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Benzo(k)fluoranthene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
bis(2-Chloroethoxy)methane	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
bis(2-Chloroethyl)ether	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
bis(2-Ethylhexyl)phthalate	390 U	6,700	380 U	370 U	380 U	390 U	360 U	380 U
Butylbenzylphthalate	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Caprolactam	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Carbazole	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Chrysene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Dibenz(a,h)anthracene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Dibenzofuran	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Diethylphthalate	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Dimethyl phthalate	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Di-n-butylphthalate	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Di-n-octylphthalate	390 UJ	420 UJ	380 UJ	370 UJ	380 U	390 U	360 UJ	380 UJ
Fluoranthene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Fluorene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Hexachlorobenzene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Hexachlorobutadiene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Hexachlorocyclopentadiene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Hexachloroethane	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Indeno(1,2,3-cd)pyrene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Isophorone	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Naphthalene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
n-Nitroso-di-n-propylamine	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
n-Nitrosodiphenylamine	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Nitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Pentachlorophenol	980 U	1,000 U	940 U	930 U	960 U	980 U	920 U	960 U
Phenanthrene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Phenol	390 U	420 J	380 U	370 U	380 U	390 U	360 U	380 U
Pyrene	390 U	420 U	380 U	370 U	380 U	390 U	360 U	380 U
Pesticide/Polychlorinated Biphenyls (UG/KG)								

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID	CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008	CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/31/08	10/31/08
Chemical Name								
4,4'-DDD	3.9 U	11	0.33 J	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
4,4'-DDE	3.9 U	6	0.23 J	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
4,4'-DDT	3.9 U	7.7	1.7 J	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Aldrin	2 U	0.27 J	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
alpha-BHC	0.28 J	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
alpha-Chlordane	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
Aroclor-1016	39 U	42 U	38 U	38 U	39 U	39 U	37 U	39 U
Aroclor-1221	78 U	83 U	75 U	76 U	77 U	78 U	74 U	77 U
Aroclor-1232	39 U	42 U	38 U	38 U	39 U	39 U	37 U	39 U
Aroclor-1242	39 U	42 U	38 U	38 U	39 U	39 U	37 U	39 U
Aroclor-1248	39 U	42 U	38 U	38 U	39 U	39 U	37 U	39 U
Aroclor-1254	39 U	42 U	38 U	38 U	39 U	39 U	37 U	39 U
Aroclor-1260	39 U	42 U	38 U	38 U	39 U	39 U	37 U	39 U
beta-BHC	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
delta-BHC	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
Dieldrin	3.9 U	0.22 J	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Endosulfan I	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
Endosulfan II	3.9 U	4.2 U	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Endosulfan sulfate	3.9 U	4.2 U	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Endrin	3.9 U	4.2 U	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Endrin aldehyde	3.9 U	4.2 U	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
Endrin ketone	3.9 U	4.2 U	3.8 U	3.8 U	3.9 U	3.9 U	3.7 U	3.9 U
gamma-BHC (Lindane)	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
gamma-Chlordane	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
Heptachlor	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
Heptachlor epoxide	2 U	2.1 U	1.9 U	1.9 U	1.9 U	2 U	1.9 U	1.9 U
Methoxychlor	20 U	21 U	19 U	19 U	19 U	20 U	19 U	19 U
Toxaphene	200 U	210 U	190 U	190 U	190 U	200 U	190 U	190 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,000 U	5,000 U	5,000 U	5,000 U	5,700 U	5,900 U	5,600 U	5,800 U
Nitroguanidine	130 U	130 U	120 U	130 U	120 U	130 U	120 U	120 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)								
Aluminum	6,710	6,620	5,880	7,190	6,810	13,000	7,400	8,220
Antimony	5.3 UL	52 UL	0.52 L	5.2 UL	6.1 UL	6.4 UL	4.6 UL	5.8 UL
Arsenic	2.5 L	23.3 L	7.9 L	3.7 L	3.8 L	5.1 L	2.8 L	3.1 L
Barium	55.4	36.2	43.2	48.6	37.5	43.6	46.5	54.9
Beryllium	0.47	0.27 J	0.45 J	0.56	0.65	0.57	0.62	0.6
Cadmium	0.06 J	4.4 U	2.5 J	0.5 J	0.01 B	0.53 U	0.04 J	0.03 B
Calcium	1,910 J	1,900 J	1,570 J	1,190 J	409 J	1,440	1,050 J	1,640 J
Chromium	8.2 K	60.6 K	136 K	58.1 K	9.7 K	17.2	7.7 K	8.8 K
Cobalt	2.5 J	10.3 J	5.8 J	4.3 J	2.5 J	5 J	2.7 J	2.8 J
Copper	4	77.4	51 J	10.1 J	3	3.4	2.9	4.1
Cyanide	0.6 U	0.6 U	0.55 U	0.55 U	0.55 U	0.6 U	0.55 U	0.55 U
Iron	6,410	213,000	71,100 J	20,500 J	7,660	16,200	5,830	6,280
Lead	9.8	264	984	486	11.2	10.5	9.8	12.9
Magnesium	658	728 J	564 J	638	665	991 J	654	767

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05	CAA07-SO06	CAA07-SO07
Sample ID	CAA07-SS01-1008	CAA07-SS02-1008	CAA07-SS03-1008	CAA07-SS03P-1008	CAA07-SS04-1008	CAA07-SS05-1008	CAA07-SS06-1008	CAA07-SS07-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/31/08	10/31/08
Chemical Name								
Manganese	140 L	921 L	436 L	263 L	232 L	132 L	205 L	227 L
Mercury	0.12 UL	0.12 UL	0.12 UL	0.12 UL	0.12 UL	0.094 U	0.1 UL	0.12 UL
Nickel	3.7	33.3 J	27.5 J	8.1 J	3.9 J	5.9 J	4.2	4.8
Potassium	606	713 J	365 J	416 J	443 J	783 J	415	528
Selenium	3.1 U	31 U	11 U	3 U	3.6 UL	3.7 UL	2.7 UL	3.4 UL
Silver	0.89 U	2.6 J	0.76 J	0.11 J	1 U	1.1 U	0.77 U	0.98 U
Sodium	23 J	27 J	29.5 J	23.8 J	12.6 B	14.8 L	11.9 B	13.4 B
Thallium	2.2 U	22 U	7.6 U	2.2 U	2.5 U	2.6 U	1.9 U	2.4 U
Vanadium	12.1	15.6 J	11.2 J	12.2	16.5	26.5	12.2	14.5
Zinc	22.3	61.3	840	388	15.8	19.9 L	16.8	22.8
Wet Chemistry								
% Solids (pct)	84	79	88	89	86	85	90	87
pH (ph)	7.3	6.7	7.1	NA	5.7	5.7	6.6	6.3
Total organic carbon (TOC) (ug/g)	25,000	40,000	32,000	NA	30,000	17,000	21,000	21,000

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 7\[1_AOC7_SS_raw.xls], Victoria Brynildsen, 12/02/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05		CAA07-SO06		CAA07-SO07	
Sample ID	CAA07-SB01-1008	CAA07-SB02-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008	CAA07-SB05-1008	CAA07-SBTP04-1008	CAA07-SB06-1008	CAA07-SBTP06-1008	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/30/08	10/31/08	10/31/08	10/31/08	10/31/08
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,1,2,2-Tetrachloroethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,1,2-Trichloroethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,1-Dichloroethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,1-Dichloroethene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,2,4-Trichlorobenzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,2-Dibromo-3-chloropropane	11 U	12 R	10 R	10 U	10 U	12 U	10 U	11 U	10 R	11 U	10 U
1,2-Dibromoethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,2-Dichlorobenzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,2-Dichloroethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,2-Dichloroethene (total)	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,2-Dichloropropane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,3-Dichlorobenzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
1,4-Dichlorobenzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
2-Butanone	11 U	2 J	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
2-Hexanone	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
4-Methyl-2-pentanone	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Acetone	4 B	12 B	4 B	2 B	3 B	5 B	3 B	11 U	4 B	11 U	6 B
Benzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Bromodichloromethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Bromoform	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Bromomethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Carbon disulfide	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Carbon tetrachloride	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Chlorobenzene	11 U	12 U	10 U	10 U	10 UJ	12 UJ	10 UJ	11 U	10 U	11 U	10 U
Chloroethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Chloroform	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Chloromethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
cis-1,2-Dichloroethene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
cis-1,3-Dichloropropene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Cyclohexane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Dibromochloromethane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Dichlorodifluoromethane (Freon-12)	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Ethylbenzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Isopropylbenzene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
m- and p-Xylene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Methyl acetate	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Methylcyclohexane	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Methylene chloride	4 B	2 B	3 B	9 B	2 B	12 U	10 U	8 B	1 B	4 B	10 B
Methyl-tert-butyl ether (MTBE)	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
o-Xylene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Styrene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Tetrachloroethene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Toluene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
trans-1,2-Dichloroethene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
trans-1,3-Dichloropropene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Trichloroethene	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Trichlorofluoromethane(Freon-11)	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Vinyl chloride	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Xylene, total	11 U	12 U	10 U	10 U	10 U	12 U	10 U	11 U	10 U	11 U	10 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2,2'-Oxybis(1-chloropropane)	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2,4,5-Trichlorophenol	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
2,4,6-Trichlorophenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2,4-Dichlorophenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2,4-Dimethylphenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05		CAA07-SO06		CAA07-SO07	
Sample ID	CAA07-SB01-1008	CAA07-SB02-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008	CAA07-SB05-1008	CAA07-SBTP04-1008	CAA07-SB06-1008	CAA07-SBTP06-1008	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/30/08	10/31/08	10/31/08	10/31/08	10/31/08
Chemical Name											
2,4-Dinitrophenol	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
2-Chloronaphthalene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2-Chlorophenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2-Methylnaphthalene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2-Methylphenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
2-Nitroaniline	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
2-Nitrophenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
3,3'-Dichlorobenzidine	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
3-Nitroaniline	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
4,6-Dinitro-2-methylphenol	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
4-Bromophenyl-phenylether	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
4-Chloro-3-methylphenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
4-Chloroaniline	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
4-Chlorophenyl-phenylether	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
4-Methylphenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
4-Nitroaniline	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
4-Nitrophenol	920 R	1,000 R	890 R	900 R	890 U	960 U	880 U	900 U	870 U	890 U	870 U
Acenaphthene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Acenaphthylene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Acetophenone	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Anthracene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Atrazine	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Benzaldehyde	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Benzo(a)anthracene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Benzo(a)pyrene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Benzo(b)fluoranthene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Benzo(g,h,i)perylene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Benzo(k)fluoranthene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
bis(2-Chloroethoxy)methane	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
bis(2-Chloroethyl)ether	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
bis(2-Ethylhexyl)phthalate	370 U	400 U	350 U	360 U	360 U	380 U	350 U	7,400	340 U	360 U	340 U
Butylbenzylphthalate	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Caprolactam	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Carbazole	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Chrysene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Dibenz(a,h)anthracene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Dibenzofuran	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Diethylphthalate	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Dimethyl phthalate	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Di-n-butylphthalate	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Di-n-octylphthalate	370 UJ	400 UJ	350 UJ	360 UJ	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Fluoranthene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Fluorene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Hexachlorobenzene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Hexachlorobutadiene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Hexachlorocyclopentadiene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Hexachloroethane	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Indeno(1,2,3-cd)pyrene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Isophorone	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Naphthalene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
n-Nitroso-di-n-propylamine	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
n-Nitrosodiphenylamine	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Nitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
Pentachlorophenol	920 U	1,000 U	890 U	900 U	890 U	960 U	880 U	900 U	870 U	890 U	870 U
Phenanthrene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Phenol	370 U	400 U	350 U	360 U	360 U	380 U	350 U	270 J	340 U	360 U	340 U
Pyrene	370 U	400 U	350 U	360 U	360 U	380 U	350 U	360 U	340 U	360 U	340 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05		CAA07-SO06		CAA07-SO07	
Sample ID	CAA07-SB01-1008	CAA07-SB02-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008	CAA07-SB05-1008	CAA07-SBTP04-1008	CAA07-SB06-1008	CAA07-SBTP06-1008	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/30/08	10/31/08	10/31/08	10/31/08	10/31/08
Chemical Name											
4,4'-DDD	3.7 U	1.4 J	3.6 U	3.7 U	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
4,4'-DDE	3.7 U	0.41 J	3.6 U	3.7 U	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
4,4'-DDT	0.75 J	1.3 J	3.6 U	0.97 J	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Aldrin	1.9 U	0.47 J	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
alpha-BHC	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
alpha-Chlordane	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Aroclor-1016	37 U	42 U	36 U	37 U	37 U	40 U	42 U	36 U	35 U	36 U	34 U
Aroclor-1221	74 U	83 U	72 U	74 U	74 U	80 U	84 U	72 U	70 U	72 U	68 U
Aroclor-1232	37 U	42 U	36 U	37 U	37 U	40 U	42 U	36 U	35 U	36 U	34 U
Aroclor-1242	37 U	42 U	36 U	37 U	37 U	40 U	42 U	36 U	35 U	36 U	34 U
Aroclor-1248	37 U	42 U	36 U	37 U	37 U	40 U	42 U	36 U	35 U	36 U	34 U
Aroclor-1254	37 U	42 U	36 U	37 U	37 U	40 U	42 U	36 U	35 U	36 U	34 U
Aroclor-1260	37 U	42 U	36 U	37 U	37 U	40 U	42 U	36 U	35 U	36 U	34 U
beta-BHC	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
delta-BHC	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Dieldrin	3.7 U	0.55 J	3.6 U	0.29 J	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endosulfan I	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Endosulfan II	3.7 U	4.2 U	3.6 U	3.7 U	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endosulfan sulfate	3.7 U	4.2 U	3.6 U	3.7 U	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endrin	0.4 J	0.6 J	3.6 U	0.33 J	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endrin aldehyde	3.7 U	0.73 J	3.6 U	3.7 U	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
Endrin ketone	3.7 U	4.2 U	3.6 U	3.7 U	3.7 U	4 U	4.2 U	3.6 U	3.5 U	3.6 U	3.4 U
gamma-BHC (Lindane)	1.9 U	0.29 J	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
gamma-Chlordane	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Heptachlor	1.9 U	0.39 J	1.8 U	0.25 J	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Heptachlor epoxide	1.9 U	2.1 U	1.8 U	1.9 U	1.9 U	2 U	2.1 U	1.8 U	1.7 U	1.8 U	1.7 U
Methoxychlor	19 U	21 U	18 U	19 U	19 U	20 U	21 U	18 U	17 U	18 U	17 U
Toxaphene	190 U	210 U	180 U	190 U	190 U	200 U	210 U	180 U	170 U	180 U	170 U
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	99 U	99 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,000 U	5,000 U	5,000 U	5,000 U	5,600 U	6,000 U	6,300 U	5,400 U	5,200 U	5,300 U	5,100 U
Nitroguanidine	130 U	120 U	130 U	130 U	63 J	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)											
Aluminum	17,300	6,820	7,390	8,080	6,640	22,900	5,870	9,310	6,550	8,340	6,740
Antimony	5.9 UL	4.9 UL	3.6 UL	4.1 UL	4.8 UL	5.9 UL	5.3 UL	5.4 UL	4.9 UL	4 UL	4.1 UL
Arsenic	5.6 L	4.3 L	2.3 L	2.8 L	2.6 L	8.1 L	3.1 L	3 L	3.9 L	2.4 L	2.3 L
Barium	46.4	7.7 J	45.8	47.3	50.7	46.1	10.7 J	44.5	8.2 J	44.8	8.7 J
Beryllium	0.5	0.48	0.44	0.45	0.74	0.65	0.28 J	0.52	0.29 J	0.52	0.3 J
Cadmium	0.49 U	0.06 J	0.38	0.63	0.04 J	0.49 U	0.44 U	0.45 U	0.41 U	0.33 U	0.34 U
Calcium	1,020 J	101 J	491 J	506 J	160 J	1,000	73.9 J	471 J	62.1 J	579 J	333 J
Chromium	20.6 K	23.3 K	29.1 K	12 K	8	29.3	11.7	10.8 K	13.5 K	8.8 K	13 K
Cobalt	3.4 J	2.1 J	2.6 J	2.8 J	2.6 J	5.2 J	0.79 J	2.8 J	0.61 J	2.8 J	0.66 J
Copper	3	5.4	2.2	5.1	2.3	3.6	1.7 B	2.5	2.3	2.4	1.6 J
Cyanide	0.55 U	0.6 U	0.5 U	0.5 U	0.55 U	0.55 U	0.5 U	0.5 U	0.5 U	0.55 U	0.5 U
Iron	18,200	16,300	6,150	11,500	5,690	30,200	9,940	7,680	10,800	5,850	9,720
Lead	9.2	6.6	175 J	26.8 J	5.5	9.8	3.6	7.2	5.5	6.4	3.5
Magnesium	1,230	1,660	627	668	598 J	1,490 J	1,070 J	761	1,150	738	1,210

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Station ID	CAA07-SO01	CAA07-SO02	CAA07-SO03		CAA07-SO04	CAA07-SO05		CAA07-SO06		CAA07-SO07	
Sample ID	CAA07-SB01-1008	CAA07-SB02-1008	CAA07-SB03-1008	CAA07-SB03P-1008	CAA07-SB04-1008	CAA07-SB05-1008	CAA07-SBTP04-1008	CAA07-SB06-1008	CAA07-SBTP06-1008	CAA07-SB07-1008	CAA07-SBTP05-1008
Sample Date	10/29/08	10/29/08	10/29/08	10/29/08	10/30/08	10/30/08	10/30/08	10/31/08	10/31/08	10/31/08	10/31/08
Chemical Name											
Manganese	53.6 L	30.9 L	85.6 L	94.8 L	270 L	62 L	13.6 L	108 L	10.8 L	104 L	12 L
Mercury	0.11 UL	0.07 L	0.11 UL	0.086 UL	0.11 U	0.04 J	0.11 U	0.11 UL	0.1 UL	0.11 UL	0.11 UL
Nickel	6.2	7.9	4	5.8	3.8 J	7.6 J	1.8 J	4.5	1.8 J	4.2	2 J
Potassium	1,050	2,520	427	452	344 J	1,270 J	1,840 J	519	2,010	476	2,030
Selenium	0.64 J	0.42 J	2.1 U	2.4 U	2.8 UL	0.46 L	3.1 UL	3.2 UL	2.9 UL	2.3 UL	2.4 UL
Silver	0.98 U	0.12 J	0.6 U	0.11 J	0.8 U	0.98 U	0.88 U	0.9 U	0.82 U	0.66 U	0.68 U
Sodium	38 J	537	23.2 J	25.2 J	14.7 J	30.4 L	440 UL	12.5 B	7.2 B	15 B	8.1 B
Thallium	2.4 U	0.11 B	1.5 U	1.7 U	2 U	2.5 U	2.2 U	2.2 U	2 U	1.7 U	1.7 U
Vanadium	33.4	34.8	12	13.7	9	44.4	14.7	16.3	18.2	12.9	14.6
Zinc	18.7	23.6	235	282	12.1 L	22.4 L	8.2 L	14.8	7.6	11.8	8.1
Wet Chemistry											
% Solids (pct)	90	82	93	93	93	86	95	92	95	93	95
pH (ph)	6.6	5.8	6.7	NA	5.3	5.2	5.1	6.2	4.8	6.1	6
Total organic carbon (TOC) (ug/g)	5,800	2,400	8,800	NA	11,000	14,000	400 J	12,000	440	8,100	160 J

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 7\[2_AOC7_SB_raw.xls], Victoria Brynildsen, 12/02/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

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Station ID	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID	CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date	10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Chemical Name					
Volatile Organic Compounds (UG/L)					
1,1,1-Trichloroethane	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
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	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
1,2-Dibromoethane	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U
Acetone	2 J	10 U	10 U	2 J	10 U
Benzene	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	2 J	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U
Methylene chloride	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U
o-Xylene	10 U	10 U	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U
Toluene	1 J	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	10 U	10 U
Xylene, total	10 U	10 U	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/L)					
1,1-Biphenyl	10 U	10 U	10 U	10 U	12 U
2,2'-Oxybis(1-chloropropane)	10 U	10 U	10 U	10 U	12 U
2,4,5-Trichlorophenol	24 U	24 U	24 U	24 U	29 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	12 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	12 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	12 U
2,4-Dinitrophenol	24 U	24 U	24 U	24 U	29 U
2,4-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,6-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	12 U
2-Chlorophenol	10 U	10 U	10 U	10 U	12 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	12 U
2-Methylphenol	10 U	10 U	10 U	10 U	12 U

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Station ID	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID	CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date	10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Chemical Name					
2-Nitroaniline	24 U	24 U	24 U	24 U	29 U
2-Nitrophenol	10 U	10 U	10 U	10 U	12 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	12 U
3-Nitroaniline	24 U	24 U	24 U	24 U	29 U
4,6-Dinitro-2-methylphenol	24 U	24 U	24 U	24 U	29 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	12 U
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	12 U
4-Chloroaniline	10 U	10 U	10 U	10 U	12 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	12 U
4-Methylphenol	10 U	10 U	10 U	10 U	12 U
4-Nitroaniline	24 U	24 U	24 U	24 U	29 U
4-Nitrophenol	24 U	24 U	24 U	24 U	29 U
Acenaphthene	10 U	10 U	10 U	10 U	12 U
Acenaphthylene	10 U	10 U	10 U	10 U	12 U
Acetophenone	10 U	10 U	10 U	10 U	12 U
Anthracene	10 U	10 U	10 U	10 U	12 U
Atrazine	10 U	10 U	10 U	10 U	12 U
Benzaldehyde	10 U	10 U	10 U	10 U	12 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U	12 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U	12 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	12 U
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	12 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	12 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	10 U	12 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U	10 U	12 U
bis(2-Ethylhexyl)phthalate	10 U	10 U	10 U	10 U	12 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U	12 U
Caprolactam	10 U	10 U	10 U	10 U	12 U
Carbazole	10 U	10 U	10 U	10 U	12 U
Chrysene	10 U	10 U	10 U	10 U	12 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	12 U
Dibenzofuran	10 U	10 U	10 U	10 U	12 U
Diethylphthalate	10 U	10 U	10 U	10 U	12 U
Dimethyl phthalate	10 U	10 U	10 U	10 U	12 U
Di-n-butylphthalate	10 U	10 U	10 U	10 U	12 U
Di-n-octylphthalate	10 UJ	10 UJ	10 UJ	10 UJ	12 UJ
Fluoranthene	10 U	10 U	10 U	10 U	12 U
Fluorene	10 U	10 U	10 U	10 U	12 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	12 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	12 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	12 U
Hexachloroethane	10 U	10 U	10 U	10 U	12 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	12 U
Isophorone	10 U	10 U	10 U	10 U	12 U
Naphthalene	10 U	10 U	10 U	10 U	12 U
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	10 U	12 U
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	12 U
Nitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Pentachlorophenol	24 U	24 U	24 U	24 U	29 U
Phenanthrene	10 U	10 U	10 U	10 U	12 U
Phenol	10 U	10 U	10 U	10 U	12 U
Pyrene	10 U	10 U	10 U	10 U	12 U
Pesticide/Polychlorinated Biphenyls (UG/L)					
4,4'-DDD	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
4,4'-DDT	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
alpha-BHC	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
Aroclor-1016	1 U	1 U	1 U	1 U	1 U
Aroclor-1221	2 U	2 U	2 U	2 U	2 U
Aroclor-1232	1 U	1 U	1 U	1 U	1 U
Aroclor-1242	1 U	1 U	1 U	1 U	1 U
Aroclor-1248	1 U	1 U	1 U	1 U	1 U
Aroclor-1254	1 U	1 U	1 U	1 U	1 U
Aroclor-1260	1 U	1 U	1 U	1 U	1 U
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U

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Station ID	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID	CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date	10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Chemical Name					
delta-BHC	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
Endosulfan I	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
Endosulfan sulfate	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
Endrin aldehyde	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
gamma-BHC (Lindane)	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
Heptachlor	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
Methoxychlor	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toxaphene	5 U	5 U	5 U	5 U	5 U
Explosives (UG/L)					
1,3,5-Trinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Amino-4,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
3,5-Dinitroaniline	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
3-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
4-Amino-2,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
HMX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U
PETN	1 U	1 U	1 U	1 U	1 U
RDX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Tetryl	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Total Metals (UG/L)					
Aluminum	38,500	2,040	3,480 J	860 J	248
Antimony	14.4 J	1 J	2.1 J	1.1 J	60 U
Arsenic	78.9	7.3 B	12.8	6.1 B	4 B
Barium	109 J	36 J	38.7 J	29.9 J	27.5 J
Beryllium	2.6 J	5 U	0.18 J	5 U	5 U
Cadmium	1.4 J	0.21 B	1.5 J	0.58 J	0.34 B
Calcium	793,000	163,000	194,000	183,000	114,000
Chromium	167	10.2	14.2	3.3 J	1.4 J
Cobalt	14.9 J	1.9 J	2.6 J	1 B	0.96 J
Copper	44.8	7.5 J	4.4 J	2.5 J	1.4 J
Cyanide	10 U	10 U	10 U	10 U	10 U
Iron	123,000	4,280	8,060 J	1,990 J	545
Lead	30.7	3.6 B	4.6 B	1.9 B	1.1 B
Magnesium	14,200	2,560 J	2,940 J	2,340 J	5,770
Manganese	180	44.4	83.7	39.4	16.8
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	83	5.8 J	9.7 J	4.3 J	11.3 J
Potassium	16,200	1,710 J	1,940 J	1,150 J	2,970 J
Selenium	26.9 J	35 U	35 U	1.3 J	35 U
Silver	10 U	10 U	10 U	10 U	10 U
Sodium	14,500	5,830	6,380	6,610	9,190
Thallium	4.2 B	2.5 B	2.8 B	2.2 B	2 B
Vanadium	203	7.3 J	14.6 J	3.6 J	0.75 J
Zinc	157	12.5 J	16.2 J	9.4 J	4.3 J
Dissolved Metals (UG/L)					
Aluminum, Dissolved	172 J	2,450	204	209	145 J
Antimony, Dissolved	60 U	60 U	60 U	60 U	0.87 J
Arsenic, Dissolved	2.2 J	7.5 B	3.7 B	4.3 B	3.5 B
Barium, Dissolved	12.4 J	35.6 J	26.9 J	26.6 J	24.9 J
Beryllium, Dissolved	5 U	5 U	5 U	5 U	5 U
Cadmium, Dissolved	0.09 B	0.23 B	0.4 B	0.34 B	0.39 B
Calcium, Dissolved	132,000	163,000	158,000	161,000	106,000
Chromium, Dissolved	1 J	7.3 J	0.67 J	0.44 J	0.71 J
Cobalt, Dissolved	0.44 B	2.1 J	0.88 B	0.73 B	0.74 B

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Station ID	CAA07-DW01	CAA07-DW02	CAA07-DW03		CAA07-DW04
Sample ID	CAA07-DW01-1008	CAA07-DW02-1008	CAA07-DW03-1008	CAA07-DW03P-1008	CAA07-DW04-1008
Sample Date	10/30/08	10/30/08	10/30/08	10/30/08	10/31/08
Chemical Name					
Copper, Dissolved	1.6 J	2.7 J	1.8 J	1.7 J	1.4 J
Iron, Dissolved	312	3,940	198	191	232
Lead, Dissolved	2 B	3.4 B	1.7 B	2.1 B	2.6 B
Magnesium, Dissolved	2,670 J	2,710 J	2,120 J	2,130 J	5,530
Manganese, Dissolved	9.4 J	39.6	40.2	32.4	13.5 J
Mercury, Dissolved	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	8 J	4.8 J	3.5 J	3.4 J	8.8 J
Potassium, Dissolved	1,940 J	1,830 J	908 J	841 J	2,840 J
Selenium, Dissolved	35 U	35 U	35 U	35 U	35 U
Silver, Dissolved	10 U	10 U	10 U	10 U	0.36 J
Sodium, Dissolved	4,600 J	5,940	5,720	5,800	8,360
Thallium, Dissolved	2.4 B	2.7 B	2.6 B	2.5 B	3.2 B
Vanadium, Dissolved	0.66 J	8 J	0.87 J	0.88 J	0.53 J
Zinc, Dissolved	6.2 J	12.2 J	4.8 J	3.6 J	5 J

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 7\[3_AOC7_GW_raw.xls], Victoria Brynildsen, 12/02/2010

Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UG/L - Micrograms per liter

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Surface Soil Data Raw Analytical Results
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Station ID	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID	CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008	CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date	10/22/08	10/22/08	10/22/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1,1-Trichloroethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,1,2-Trichloroethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,1-Dichloroethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,1-Dichloroethene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2,4-Trichlorobenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2-Dibromo-3-chloropropane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2-Dibromoethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2-Dichlorobenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2-Dichloroethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2-Dichloroethene (total)	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,2-Dichloropropane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,3-Dichlorobenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
1,4-Dichlorobenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
2-Butanone	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
2-Hexanone	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
4-Methyl-2-pentanone	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Acetone	3 B	36 J	11 U	11 U	10 U	3 B	12 U	11 U	3 B	3 B	3 B
Benzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Bromodichloromethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Bromoform	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Bromomethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Carbon disulfide	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Carbon tetrachloride	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Chlorobenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Chloroethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Chloroform	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Chloromethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
cis-1,2-Dichloroethene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
cis-1,3-Dichloropropene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Cyclohexane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Dibromochloromethane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Dichlorodifluoromethane (Freon-12)	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Ethylbenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Isopropylbenzene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
m- and p-Xylene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Methyl acetate	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Methylcyclohexane	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Methylene chloride	3 B	6 B	3 B	4 B	2 B	5 B	5 B	2 B	6 B	3 B	4 B
Methyl-tert-butyl ether (MTBE)	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
o-Xylene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Styrene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Tetrachloroethene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Toluene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
trans-1,2-Dichloroethene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
trans-1,3-Dichloropropene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Trichloroethene	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Trichlorofluoromethane(Freon-11)	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Vinyl chloride	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Xylene, total	11 U	10 U	11 U	11 U	10 U	12 U	12 U	11 U	11 U	11 U	11 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2,2'-Oxybis(1-chloropropane)	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2,4,5-Trichlorophenol	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 U	900 U	900 U
2,4,6-Trichlorophenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2,4-Dichlorophenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2,4-Dimethylphenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U

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Station ID	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID	CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008	CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date	10/22/08	10/22/08	10/22/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name											
2,4-Dinitrophenol	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 U	900 U	900 U
2,4-Dinitrotoluene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	99 U	99 U	100 U	100 U	100 U	410 U	400 U	360 U	380 U	360 U	360 U
2-Chloronaphthalene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2-Chlorophenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2-Methylnaphthalene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2-Methylphenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
2-Nitroaniline	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 U	900 U	900 U
2-Nitrophenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
3,3'-Dichlorobenzidine	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
3-Nitroaniline	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 R	900 R	900 R
4,6-Dinitro-2-methylphenol	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 U	900 U	900 U
4-Bromophenyl-phenylether	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
4-Chloro-3-methylphenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
4-Chloroaniline	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
4-Chlorophenyl-phenylether	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
4-Methylphenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
4-Nitroaniline	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 U	900 U	900 U
4-Nitrophenol	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 R	900 R	900 R
Acenaphthene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Acenaphthylene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Acetophenone	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Anthracene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Atrazine	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Benzaldehyde	360 U	370 U	370 U	180 J	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Benzo(a)anthracene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Benzo(a)pyrene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Benzo(b)fluoranthene	360 U	370 U	370 U	290 J	360 U	410 U	400 U	360 U	270 J	360 U	360 U
Benzo(g,h,i)perylene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Benzo(k)fluoranthene	360 U	370 U	370 U	210 J	360 U	410 U	400 U	360 U	210 J	360 U	360 U
bis(2-Chloroethoxy)methane	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
bis(2-Chloroethyl)ether	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
bis(2-Ethylhexyl)phthalate	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Butylbenzylphthalate	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Caprolactam	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Carbazole	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Chrysene	360 U	370 U	370 U	210 J	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Dibenz(a,h)anthracene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Dibenzofuran	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Diethylphthalate	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Dimethyl phthalate	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Di-n-butylphthalate	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Di-n-octylphthalate	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Fluoranthene	360 U	370 U	370 U	260 J	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Fluorene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Hexachlorobenzene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Hexachlorobutadiene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Hexachlorocyclopentadiene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Hexachloroethane	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Indeno(1,2,3-cd)pyrene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Isophorone	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Naphthalene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
n-Nitroso-di-n-propylamine	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
n-Nitrosodiphenylamine	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Nitrobenzene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Pentachlorophenol	900 U	940 U	930 U	900 U	900 U	1,000 U	990 U	920 U	960 U	900 U	900 U
Phenanthrene	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Phenol	360 U	370 U	370 U	360 U	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Pyrene	360 U	370 U	370 U	250 J	360 U	410 U	400 U	360 U	380 U	360 U	360 U
Pesticide/Polychlorinated Biphenyls (UG/KG)											

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Station ID	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID	CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008	CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date	10/22/08	10/22/08	10/22/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name											
4,4'-DDD	3.6 U	3.6 U	0.23 J	2.4 J	0.37 J	3.8 U	3.8 U	3.7 U	0.92 J	3.6 U	3.6 U
4,4'-DDE	3.6 U	3.6 U	0.34 J	4.8 J	17	0.31 J	0.64 J	1.3 J	2 J	3.6 U	3.6 U
4,4'-DDT	0.44 J	3.6 U	1.2 J	7.3 U	14	3.8 U	3.8 U	2.3 J	7.1 J	3.6 U	3.6 U
Aldrin	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
alpha-BHC	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
alpha-Chlordane	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Aroclor-1016	36 U	36 U	38 U	73 U	36 U	38 U	38 U	37 U	39 U	36 U	36 U
Aroclor-1221	72 U	72 U	76 U	150 U	72 U	76 U	75 U	74 U	78 U	72 U	72 U
Aroclor-1232	36 U	36 U	38 U	73 U	36 U	38 U	38 U	37 U	39 U	36 U	36 U
Aroclor-1242	36 U	36 U	38 U	73 U	36 U	38 U	38 U	37 U	39 U	36 U	36 U
Aroclor-1248	36 U	36 U	38 U	73 U	36 U	38 U	38 U	37 U	39 U	36 U	36 U
Aroclor-1254	36 U	36 U	38 U	73 U	36 U	38 U	38 U	37 U	39 U	36 U	36 U
Aroclor-1260	36 U	36 U	38 U	420	36 U	110 J	190	37 U	180	36 U	36 U
beta-BHC	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
delta-BHC	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Dieldrin	0.29 J	3.6 U	0.34 J	7.3 U	3.6 U	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
Endosulfan I	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Endosulfan II	3.6 U	3.6 U	3.8 U	7.3 U	3.6 U	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
Endosulfan sulfate	3.6 U	3.6 U	3.8 U	7.3 U	3.6 U	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
Endrin	3.6 U	3.6 U	3.8 U	7.3 U	3.6 U	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
Endrin aldehyde	3.6 U	3.6 U	0.43 J	21 J	3.6 U	4.2 J	8.2 J	0.33 J	12 J	3.6 U	3.6 U
Endrin ketone	3.6 U	3.6 U	3.8 U	7.3 U	3.6 U	3.8 U	3.8 U	3.7 U	3.9 U	3.6 U	3.6 U
gamma-BHC (Lindane)	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
gamma-Chlordane	1.8 U	1.8 U	1.9 U	0.81 J	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Heptachlor	1.8 U	1.8 U	1.9 U	3.6 U	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Heptachlor epoxide	1.8 U	1.8 U	1.9 U	0.76 J	1.8 U	1.9 U	1.9 U	1.9 U	2 U	1.8 U	1.8 U
Methoxychlor	18 U	18 U	19 U	36 U	18 U	19 UJ	19 UJ	19 UJ	20 UJ	18 UJ	18 UJ
Toxaphene	180 U	180 U	190 U	360 U	180 U	190 U	190 U	190 U	200 U	180 U	180 U
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	99 U	99 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,300 U	5,400 U	5,700 U	5,400 U	5,400 U	2,800 U	2,800 U	2,800 U	2,900 U	2,700 U	2,700 U
Nitroguanidine	130 U	130 U	120 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	490 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)											
Aluminum	7,900	3,870	6,760	11,600	9,290	4,260	8,970	10,300	9,400	7,810	8,380
Antimony	5.2 R	5.4 R	5.4 R	1.7 L	5.5 R	5.1 R	4.9 R	6.4 R	0.71 L	5.7 UL	4.3 UL
Arsenic	3.3 K	2.4 K	3.7 K	15.4 K	3.2 K	1.8 K	3 K	3.5 K	9.1 K	2.4 L	2.5 L
Barium	32.6	12.1 J	32.4	69.1	16.1 J	8.1 J	19.5	68.4	47.6	42.3	45
Beryllium	0.33 J	0.2 J	0.32 J	0.55	0.29 J	0.35 J	0.4 J	0.47 J	0.37 J	0.48 J	0.48
Cadmium	0.09 J	0.08 J	0.11 J	0.71	0.09 J	0.12 J	0.17 J	0.14 J	0.38 J	0.03 B	0.36 U
Calcium	1,010	395 J	930	6,170	802	430	826	2,860	1,770	489 J	545 J
Chromium	11	7.7	9.4	26.5	13.9	18.7	20.5	20.6	16.8	7.6 K	8.1 K
Cobalt	1.3 J	0.72 J	1.3 J	2.8 J	1.3 J	1.7 J	2 J	3.3 J	1.8 J	2.5 J	2.5 J
Copper	4.2	2 J	6	40.3	2.8	2.6	4.1	7.3	21.4	3.6	3.6
Cyanide	0.55 U	0.55 U	0.5 U	0.5 U	0.5 U	0.55 U	0.6 U	0.55 U	0.55 U	0.55 U	0.5 U
Iron	7,950	5,020	7,760	15,800	9,320	6,560	9,690	12,300	9,000	4,980	6,330
Lead	21.3	8.8	18.7	60.7	6.4	3 J	9.6 J	10.6	39.4	17.4	17.6
Magnesium	650	600	615	1,930	852	664	1,020	3,180	920	538	570

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Sample ID	CAA08-SB01-1008	CAA08-SBTP24-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SBTP14-1008	CAA08-SB04-1008	CAA08-SB05-1008	CAA08-SBTP19-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008	CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date	10/22/08	10/27/08	10/22/08	10/22/08	10/23/08	10/24/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,1-Trichloroethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,1,2,2-Tetrachloroethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,1,2-Trichloroethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,1-Dichloroethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,1-Dichloroethene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2,4-Trichlorobenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2-Dibromo-3-chloropropane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2-Dibromoethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2-Dichlorobenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2-Dichloroethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2-Dichloroethene (total)	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,2-Dichloropropane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,3-Dichlorobenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
1,4-Dichlorobenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	1 J	12 U	12 U	12 U	11 U	10 U	10 U
2-Butanone	12 U	12 U	11 U	12 U	11 U	11 U	10 U	2 J	2 J	12 U	12 U	11 U	10 U	10 U
2-Hexanone	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
4-Methyl-2-pentanone	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Acetone	28 B	12 U	11 U	12 U	11 U	4 B	10 U	13 B	13 B	4 B	4 B	11 U	3 B	3 B
Benzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Bromodichloromethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Bromoform	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Bromomethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Carbon disulfide	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Carbon tetrachloride	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Chlorobenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Chloroethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Chloroform	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Chloromethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
cis-1,2-Dichloroethene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
cis-1,3-Dichloropropene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Cyclohexane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Dibromochloromethane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Ethylbenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Isopropylbenzene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
m- and p-Xylene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Methyl acetate	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Methylcyclohexane	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Methylene chloride	36 B	3 B	3 B	3 B	2 B	6 B	3 B	2 B	6 B	4 B	6 B	3 B	6 B	5 B
Methyl-tert-butyl ether (MTBE)	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
o-Xylene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Styrene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Tetrachloroethene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Toluene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
trans-1,2-Dichloroethene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
trans-1,3-Dichloropropene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Trichloroethene	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Trichlorofluoromethane(Freon-11)	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Vinyl chloride	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Xylene, total	12 U	12 U	11 U	12 U	11 U	11 U	10 U	11 U	12 U	12 U	12 U	11 U	10 U	10 U
Semivolatile Organic Compounds (UG/KG)														
1,1-Biphenyl	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2,2'-Oxybis(1-chloropropane)	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2,4,5-Trichlorophenol	1,000 U	1,000 U	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 U	920 U	880 U	870 U
2,4,6-Trichlorophenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2,4-Dichlorophenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2,4-Dimethylphenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2,4-Dinitrophenol	1,000 U	1,000 U	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 U	920 U	880 U	870 U
2,4-Dinitrotoluene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	99 U	410 U	100 U	100 U	100 U	98 U	100 U	100 U	390 U	400 U	380 U	370 U	350 U	350 U

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Sample ID	CAA08-SB01-1008	CAA08-SBTP24-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SBTP14-1008	CAA08-SB04-1008	CAA08-SB05-1008	CAA08-SBTP19-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008	CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date	10/22/08	10/27/08	10/22/08	10/22/08	10/23/08	10/24/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name														
2-Chloronaphthalene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2-Chlorophenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2-Methylnaphthalene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2-Methylphenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
2-Nitroaniline	1,000 U	1,000 U	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 U	920 U	880 U	870 U
2-Nitrophenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
3,3'-Dichlorobenzidine	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
3-Nitroaniline	1,000 U	1,000 R	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 R	920 R	880 R	870 R
4,6-Dinitro-2-methylphenol	1,000 U	1,000 U	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 U	920 U	880 U	870 U
4-Bromophenyl-phenylether	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
4-Chloro-3-methylphenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
4-Chloroaniline	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
4-Chlorophenyl-phenylether	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
4-Methylphenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
4-Nitroaniline	1,000 U	1,000 U	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 U	920 U	880 U	870 U
4-Nitrophenol	1,000 U	1,000 R	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 R	920 R	880 R	870 R
Acenaphthene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Acenaphthylene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Acetophenone	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Anthracene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Atrazine	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Benzaldehyde	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Benzo(a)anthracene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Benzo(a)pyrene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Benzo(b)fluoranthene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Benzo(g,h,i)perylene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Benzo(k)fluoranthene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
bis(2-Chloroethoxy)methane	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
bis(2-Chloroethyl)ether	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
bis(2-Ethylhexyl)phthalate	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Butylbenzylphthalate	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Caprolactam	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Carbazole	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Chrysene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Dibenz(a,h)anthracene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Dibenzofuran	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Diethylphthalate	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Dimethyl phthalate	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Di-n-butylphthalate	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Di-n-octylphthalate	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Fluoranthene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Fluorene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Hexachlorobenzene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Hexachlorobutadiene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Hexachlorocyclopentadiene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Hexachloroethane	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Indeno(1,2,3-cd)pyrene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Isophorone	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Naphthalene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
n-Nitroso-di-n-propylamine	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
n-Nitrosodiphenylamine	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Nitrobenzene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
Pentachlorophenol	1,000 U	1,000 U	950 U	980 U	890 U	900 U	880 U	960 U	990 U	1,000 U	960 U	920 U	880 U	870 U
Phenanthrene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Phenol	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Pyrene	410 U	410 U	380 U	390 U	350 U	360 U	350 U	380 U	390 U	400 U	380 U	370 U	350 U	350 U
Pesticide/Polychlorinated Biphenyls (UG/KG)														
4,4'-DDD	3.5 U	4 U	4.1 U	3.7 U	7.4 U	7.2 U	1.3 J	390 U	4 U	4 U	4	3.7 U	3.5 U	3.5 U
4,4'-DDE	3.5 U	4 U	4.1 U	0.38 J	7.2 J	4.5 J	6.8	390 J	0.34 J	4 U	7.8	3.7 U	3.5 U	3.5 U
4,4'-DDT	3.5 U	4 U	4.1 U	0.48 J	7.4 U	24 J	3 J	390 U	4 U	4 U	13	0.53 J	3.5 U	3.5 U
Aldrin	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
alpha-BHC	1.8 U	2 U	2 U	1.9 U	3.7 U	0.81 J	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
alpha-Chlordane	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U

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Station ID	CAA08-SO01		CAA08-SO02	CAA08-SO03	CAA08-SO04		CAA08-SO05		CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID	CAA08-SB01-1008	CAA08-SBTP24-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SBTP14-1008	CAA08-SB04-1008	CAA08-SB05-1008	CAA08-SBTP19-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008	CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date	10/22/08	10/27/08	10/22/08	10/22/08	10/23/08	10/24/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name														
Aroclor-1016	35 U	40 U	41 U	37 U	74 U	72 U	35 U	3,900 U	40 U	40 U	37 U	37 U	35 U	35 U
Aroclor-1221	71 U	80 U	82 U	74 U	150 U	140 U	71 U	7,800 U	80 U	80 U	74 U	74 U	70 U	70 U
Aroclor-1232	35 U	40 U	41 U	37 U	74 U	72 U	35 U	3,900 U	40 U	40 U	37 U	37 U	35 U	35 U
Aroclor-1242	35 U	40 U	41 U	37 U	74 U	72 U	35 U	3,900 U	40 U	40 U	37 U	37 U	35 U	35 U
Aroclor-1248	35 U	40 U	41 U	37 U	74 U	72 U	35 U	3,900 U	40 U	40 U	37 U	37 U	35 U	35 U
Aroclor-1254	35 U	40 U	41 U	37 U	74 U	72 U	35 U	3,900 U	40 U	40 U	37 U	37 U	35 U	35 U
Aroclor-1260	35 U	36 J	41 U	37 U	400	500 J	35 U	26,000 J	40 U	40 U	37 U	37 U	35 U	35 U
beta-BHC	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
delta-BHC	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
Dieldrin	3.5 U	4 U	4.1 U	0.35 J	7.4 U	7.2 U	3.5 U	390 U	4 U	4 U	3.7 U	3.7 U	3.5 U	3.5 U
Endosulfan I	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
Endosulfan II	3.5 U	4 U	4.1 U	3.7 U	7.4 U	7.2 U	3.5 U	390 U	4 U	4 U	3.7 U	3.7 U	3.5 U	3.5 U
Endosulfan sulfate	3.5 U	4 U	4.1 U	3.7 U	7.4 U	7.2 U	3.5 U	390 U	4 U	4 U	3.7 U	3.7 U	3.5 U	3.5 U
Endrin	3.5 U	0.48 J	4.1 U	3.7 U	7.4 U	7.2 U	3.5 U	390 U	0.5 J	4 U	3.7 U	3.7 U	3.5 U	3.5 U
Endrin aldehyde	3.5 U	2.2 J	4.1 U	0.36 J	22 J	24 J	3.5 U	1,600 J	1.7 J	0.51 J	3.7 U	0.72 J	3.5 U	3.5 U
Endrin ketone	3.5 U	4 U	4.1 U	3.7 U	7.4 U	7.2 U	3.5 U	390 U	4 U	4 U	3.7 U	3.7 U	3.5 U	3.5 U
gamma-BHC (Lindane)	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
gamma-Chlordane	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
Heptachlor	1.8 U	2 U	2 U	1.9 U	3.7 U	3.6 U	1.8 U	31 J	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
Heptachlor epoxide	1.8 U	2 U	2 U	1.9 U	3.7 U	1.7 J	1.8 U	190 U	2 U	2 U	1.9 U	1.8 U	1.8 U	1.8 U
Methoxychlor	18 U	20 UJ	20 U	19 U	37 U	36 U	18 U	1,900 U	20 UJ	20 UJ	19 UJ	18 UJ	18 UJ	18 UJ
Toxaphene	180 U	200 U	200 U	190 U	370 U	360 U	180 U	19,000 U	200 U	200 U	190 U	180 U	180 U	180 U
Explosives (UG/KG)														
1,3,5-Trinitrobenzene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3,5-Dinitroaniline	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	99 U	100 U	100 U	100 U	100 U	98 U	100 U	100 U	99 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitroglycerin	5,300 U	3,000 U	6,100 U	5,500 U	5,500 U	5,400 U	5,300 U	5,800 U	3,000 U	3,000 U	2,800 U	2,800 U	2,600 U	2,600 U
Nitroguanidine	130 U	120 U	120 U	130 U	120 U	130 U	130 U	130 U	130 U	120 U	130 U	120 U	130 U	120 U
PETN	490 U	500 U	500 U	500 U	500 U	490 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)														
Aluminum	9,820	3,730	5,410	9,610	12,500	7,970	5,630	4,020	4,140	4,890	8,870	8,230	7,500	7,480
Antimony	3.9 R	0.48 L	4.1 R	6.9 R	4.5 R	0.33 L	4.2 R	4.8 R	5.5 R	5.1 R	5 UL	5.5 R	3.3 UL	3.9 UL
Arsenic	3 K	9.2 K	5 K	3.7 K	3.6 K	6.7 K	2.7 K	1.4 K	1.5 K	2.4 K	4.4 L	3.5 K	1.8 L	2.1 L
Barium	35.7	5.7 J	8.1 J	35.4	29.6	38.7	14.4	10.5 J	8.5 J	9.2 J	40.5	30.1	41.8	46.9
Beryllium	0.31 J	0.2 J	0.28 J	0.42 J	0.38 J	0.46 J	0.42	0.38 J	0.36 J	0.37 J	0.32 J	0.32 J	0.35	0.4
Cadmium	0.06 J	0.08 J	0.04 B	0.1 J	0.02 B	0.45 J	0.44	0.86	0.1 J	0.12 J	0.41 U	0.06 B	0.27 U	0.33 U
Calcium	590	451	389	730	943	4,350	11,100	461	256 J	331 J	7,840 J	626	331 J	350 J
Chromium	11.5	13.8	15.7	14.7	18.8	15.8	14.8	14.3	15.9	19	25.8 K	10.9	7.4 K	7.6 K
Cobalt	1.4 J	0.44 J	0.63 J	1.6 J	1.7 J	2.3 J	1.8 J	1.7 J	1.6 J	2.7 J	2.3 J	1.4 J	1.8 J	2.1 J
Copper	3.7	3.6	1.9	3.9	2.6	13.2	2.3	6.8	2.2 J	2 J	6.5	4	1.6	1.6
Cyanide	0.6 U	0.55 U	0.55 U	0.6 U	0.5 U	0.5 U	0.5 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.5 U	0.5 U
Iron	7,450	5,250	7,250	9,270	11,000	10,100	8,160	4,520	5,890	6,710	10,100	7,520	4,380	4,700
Lead	17.6	4.5	3.4	19.4	4.3	43.1	4.6	22.3	2.5	2.7	11.1	14	6.2	6.9
Magnesium	700	448	1,010	996	987	1,770	911	651	643	840	1,720	700	510	508
Manganese	50.7 L	22 L	13.3 L	65 L	25.6 L	112 L	31 L	22 L	16 L	18.7 L	84.1 L	42.2 L	59 L	72.5 L
Mercury	0.1 UL	0.12 UL	0.088 UL	0.09 UL	0.1 UL	0.04 L	0.1 UL	0.87	0.12 UL	0.13 UL	0.1 UL	0.11 UL	0.1 UL	0.11 UL
Nickel	4.2	1.1 J	2 J	4.6	4.4	5.6	5.2	4.7	5.3	7.1	9.3	3.5 J	3.3	3.5
Potassium	609	605	1,660	1,040	949	1,510	1,120	707	740	948	1,560	721	341	314 J
Selenium	2.3 U	0.4 J	2.4 U	4 U	0.37 J	3.6 U	0.29 J	2.8 U	3.2 U	3 U	2.9 U	3.2 U	1.9 U	2.3 U
Silver	0.04 J	0.75 U	0.69 U	1.2 U	0.76 U	1 U	0.7 U	0.79 U	0.91 U	0.86 U	0.82 U	0.92 U	0.54 U	0.66 U
Sodium	36 J	15.1 J	21.9 J	29.1 J	56 J	65.3 J	159 J	19.9 J	16.8 J	17.4 J	69 J	20.6 J	31 J	25.8 J
Thallium	2.1 U	1.8 U	2.4 U	1.8 U	2 U	2.3 U	2 U	2 U	1.6 U	2.6 U	2.1 U	1.7 U	1.4 U	1.6 U
Vanadium	17	14.8	18.6	18.8	28	21	18.4	16.8	16.9	17.3	22.6	16.2	10.7	10.7

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Station ID	CAA08-SO01		CAA08-SO02	CAA08-SO03	CAA08-SO04		CAA08-SO05		CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID	CAA08-SB01-1008	CAA08-SBTP24-1008	CAA08-SB02-1008	CAA08-SB03-1008	CAA08-SBTP14-1008	CAA08-SB04-1008	CAA08-SB05-1008	CAA08-SBTP19-1008	CAA08-SB06-1008	CAA08-SB06P-1008	CAA08-SB07-1008	CAA08-SB08-1008	CAA08-SB09-1008	CAA08-SB09P-1008
Sample Date	10/22/08	10/27/08	10/22/08	10/22/08	10/23/08	10/24/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name														
Zinc	15.2	13.7	7.8	20.5	13.2	88.8	15.1	28.1	10.6	15.8	21	16.4	10.6	11.2
Wet Chemistry														
% Solids (pct)	80	80	87	85	94	92	95	86	84	82	86	90	94	95
pH (ph)	6.3	7.4	5.7	6.6	7.1	7.3	8.4	7.8	5.2	NA	8.6	7.4	5.7	NA
Total organic carbon (TOC) (ug/g)	12,000 K	560 K	1,000 K	6,500 K	2,900 K	35,000 K	7,900 K	2,700 K	800 K	NA	7,300	4,500 K	8,100	NA

C:\Users\kmalley\Documents\Work\Graycochea_Kathleen\JANUARY\Jan. 17 - CAS Site Inspection\Appendix F_Laboratory Analytical Results\AOC 8\[2_AOC8_SB_raw.xls], Victoria Brynildsen, 12/02/2010

Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram

Cheatham Annex
AOC 8
Groundwater Data Raw Analytical Results
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Station ID	CAA08-DW01	CAA08-DW02	CAA08-DW03	CAA08-DW04	
Sample ID	CAA08-DW01-1008	CAA08-DW02-1008	CAA08-DW03-1008	CAA08-DW04-1008	CAA08-DW04P-1008
Sample Date	10/28/08	10/28/08	10/27/08	10/27/08	10/27/08
Chemical Name					
Volatile Organic Compounds (UG/L)					
1,1,1-Trichloroethane	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
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	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
1,2-Dibromoethane	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U	10 U
Benzene	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U
Methylene chloride	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U
o-Xylene	10 U	10 U	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	7 J	10 U	10 U	10 U
Toluene	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	10 U	10 U
Xylene, total	10 U	10 U	10 U	10 U	10 U
Semivolatile Organic Compounds (UG/L)					
1,1-Biphenyl	10 U	10 U	10 U	10 U	10 U
2,2'-Oxybis(1-chloropropane)	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	24 U	25 U	24 U	25 U	24 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U

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December 2010

Station ID	CAA08-DW01	CAA08-DW02	CAA08-DW03	CAA08-DW04	
Sample ID	CAA08-DW01-1008	CAA08-DW02-1008	CAA08-DW03-1008	CAA08-DW04-1008	CAA08-DW04P-1008
Sample Date	10/28/08	10/28/08	10/27/08	10/27/08	10/27/08
Chemical Name					
2,4-Dinitrophenol	24 U	25 U	24 U	25 U	24 U
2,4-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,6-Dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U
2-Methylphenol	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	24 U	25 U	24 U	25 U	24 U
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	24 U	25 U	24 U	25 U	24 U
4,6-Dinitro-2-methylphenol	24 U	25 U	24 U	25 U	24 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U	10 U	10 U
4-Nitroaniline	24 U	25 U	24 U	25 U	24 U
4-Nitrophenol	24 U	25 U	24 U	25 U	24 U
Acenaphthene	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U	10 U
Acetophenone	10 U	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U	10 U
Atrazine	10 U	10 U	10 U	10 U	10 U
Benzaldehyde	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U	10 U
Caprolactam	10 U	10 U	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U	10 U	10 U
Dimethyl phthalate	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10 U	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U	10 U
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	10 U	10 U
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Pentachlorophenol	24 U	25 U	24 U	25 U	24 U
Phenanthrene	10 U	10 U	10 U	10 U	10 U
Phenol	10 U	10 U	10 U	10 U	10 U
Pyrene	10 U	10 U	10 U	10 U	10 U
Pesticide/Polychlorinated Biphenyls (UG/L)					

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Station ID	CAA08-DW01	CAA08-DW02	CAA08-DW03	CAA08-DW04	
Sample ID	CAA08-DW01-1008	CAA08-DW02-1008	CAA08-DW03-1008	CAA08-DW04-1008	CAA08-DW04P-1008
Sample Date	10/28/08	10/28/08	10/27/08	10/27/08	10/27/08
Chemical Name					
4,4'-DDD	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
4,4'-DDE	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
4,4'-DDT	0.1 U	0.11 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
alpha-BHC	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
Aroclor-1016	1 U	1.1 U	1 U	1 U	1 U
Aroclor-1221	2 U	2.1 U	2 U	2 U	2 U
Aroclor-1232	1 U	1.1 U	1 U	1 U	1 U
Aroclor-1242	1 U	1.1 U	1 U	1 U	1 U
Aroclor-1248	1 U	1.1 U	1 U	1 U	1 U
Aroclor-1254	1 U	1.1 U	1 U	1 U	1 U
Aroclor-1260	1 U	1.1 U	1 U	1 U	1 U
beta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
delta-BHC	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Dieldrin	0.1 U	0.11 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
Endosulfan II	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
Endosulfan sulfate	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
Endrin	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
Endrin aldehyde	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
Endrin ketone	0.1 U	0.11 U	0.1 U	0.1 U	0.1 U
gamma-BHC (Lindane)	0.05 U	0.05 U	0.05 UL	0.05 U	0.05 U
gamma-Chlordane	0.05 U	0.05 U	0.05 U	0.05 U	0.05 U
Heptachlor	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
Methoxychlor	0.5 U	0.53 U	0.5 U	0.5 U	0.5 U
Toxaphene	5 U	5.3 U	5 U	5 U	5 U
Explosives (UG/L)					
1,3,5-Trinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
1,3-Dinitrobenzene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2,4,6-Trinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Amino-4,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
2-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
3,5-Dinitroaniline	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
3-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
4-Amino-2,6-dinitrotoluene	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
4-Nitrotoluene	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
HMX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U
PETN	1 U	1 U	1 U	1 U	1 U
RDX	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Tetryl	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Total Metals (UG/L)					
Aluminum	1,050 B	1,900	127 B	841	470
Antimony	60 U	60 U	60 U	60 U	60 U
Arsenic	5.6 B	10.1 B	4.3 B	14.6	13.9 B
Barium	15.2 J	20.6 J	12.7 J	16.7 J	15.8 J
Beryllium	5 U	0.18 J	5 U	5 U	5 U
Cadmium	0.19 B	1.1 J	0.52 B	0.85 J	0.67 B
Calcium	99,300	76,800	83,800	96,700	92,800
Chromium	4.3 B	7.6 B	10 U	3.2 B	1.8 B
Cobalt	4.4 J	3 B	1.1 J	5.8 J	5.4 J
Copper	2.8 B	2.2 B	1.3 B	2.3 B	1.6 B
Cyanide	10 U	10 U	10 U	10 U	10 U
Iron	1,700 B	3,270 B	433 B	8,300	7,400
Lead	10 U	3.1 B	1.2 J	1.1 J	10 U
Magnesium	2,540 J	1,750 J	2,310 J	3,720 J	3,590 J

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December 2010

Station ID	CAA08-DW01	CAA08-DW02	CAA08-DW03	CAA08-DW04	
Sample ID	CAA08-DW01-1008	CAA08-DW02-1008	CAA08-DW03-1008	CAA08-DW04-1008	CAA08-DW04P-1008
Sample Date	10/28/08	10/28/08	10/27/08	10/27/08	10/27/08
Chemical Name					
Manganese	55.8	60.4	20.7	246	238
Mercury	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel	8.4 B	8.7 B	3.9 B	4.6 B	3.6 B
Potassium	1,220 J	1,510 J	548 L	3,410 J	3,210 J
Selenium	1.4 J	35 U	35 U	35 U	35 U
Silver	10 U	10 U	10 U	10 U	10 U
Sodium	4,270 J	6,950	7,680	16,200	15,600
Thallium	2.2 B	2 B	1.7 B	25 U	25 U
Vanadium	3.6 B	8.2 J	0.62 B	3.4 B	2 B
Zinc	15.2 B	12.6 B	8.4 B	7.2 B	4.3 B
Dissolved Metals (UG/L)					
Aluminum, Dissolved	122 J	135 J	114 B	140 J	125 J
Antimony, Dissolved	60 U	60 U	60 U	60 U	60 U
Arsenic, Dissolved	4.5 B	4.4 B	4.6 B	13.8	12.4 B
Barium, Dissolved	12.2 J	13.5 J	13.3 J	14.8 J	14.7 J
Beryllium, Dissolved	5 U	5 U	5 U	5 U	5 U
Cadmium, Dissolved	0.16 B	0.59 B	0.56 B	0.66 B	0.63 B
Calcium, Dissolved	99,500	76,400	84,100	92,300	91,700
Chromium, Dissolved	0.76 J	10 U	0.51 J	10 U	0.41 J
Cobalt, Dissolved	1.5 J	1.5 J	0.82 J	5.2 J	5.2 J
Copper, Dissolved	1.7 B	0.91 B	25 U	1.4 J	25 U
Iron, Dissolved	49.3 B	208	295	6,650	6,720
Lead, Dissolved	10 U	10 U	10 U	10 U	10 U
Magnesium, Dissolved	2,370 J	1,280 J	2,280 J	3,520 J	3,550 J
Manganese, Dissolved	16.4	32.4	17.7	240	237
Mercury, Dissolved	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel, Dissolved	2.7 B	5.5 J	3.6 J	3 B	3.2 J
Potassium, Dissolved	852 L	932 L	584 L	3,130 J	3,140 J
Selenium, Dissolved	35 U	35 U	35 U	35 U	35 U
Silver, Dissolved	10 U	10 U	10 U	10 U	10 U
Sodium, Dissolved	4,280 J	6,820	7,690	15,900	15,700
Thallium, Dissolved	25 U	1.6 B	25 U	1.9 J	25 U
Vanadium, Dissolved	50 U	0.64 J	0.54 J	0.54 J	0.43 J
Zinc, Dissolved	5.6 B	4.3 B	6.7 B	2.7 B	2.6 B

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

Cheatham Annex
AOC 8
Surface Soil Data Raw Analytical Results
December 2010

Station ID	CAA08-SO01	CAA08-SO02	CAA08-SO03	CAA08-SO04	CAA08-SO05	CAA08-SO06		CAA08-SO07	CAA08-SO08	CAA08-SO09	
Sample ID	CAA08-SS01-1008	CAA08-SS02-1008	CAA08-SS03-1008	CAA08-SS04-1008	CAA08-SS05-1008	CAA08-SS06-1008	CAA08-SS06P-1008	CAA08-SS07-1008	CAA08-SS08-1008	CAA08-SS09-1008	CAA08-SS09P-1008
Sample Date	10/22/08	10/22/08	10/22/08	10/24/08	10/24/08	10/27/08	10/27/08	10/27/08	10/28/08	10/28/08	10/28/08
Chemical Name											
Manganese	59.6 L	23.3 L	59.6 L	170 L	24 L	17.6 L	24.4 L	144 L	72.3 L	106 L	110 L
Mercury	0.09 UL	0.084 UL	0.11 UL	0.04 L	0.11 UL	0.098 UL	0.13 UL	0.1 UL	0.12 UL	0.11 UL	0.11 UL
Nickel	3.7	1.7 J	3.4 J	8	3.6 J	4.5	5.3	8.3	5.4	4	4.2
Potassium	555	893	470	1,590	1,090	705	1,140	3,200	778	367 J	382
Selenium	3 U	3.1 U	3.2 U	0.6 J	3.2 U	3 U	2.9 U	3.8 U	2.8 U	3.3 U	2.5 U
Silver	0.86 U	0.89 U	0.91 U	0.89 U	0.92 U	0.85 U	0.82 U	1.1 U	0.81 U	0.95 U	0.71 U
Sodium	31 J	18.7 J	24.3 J	125 J	26.4 J	17.8 J	33.5 J	72.6 J	46.4 J	36.2 J	34.8 J
Thallium	0.08 J	2.5 U	2.1 U	2.2 U	0.06 J	2.2 U	2.2 U	2.1 U	1.7 U	2.4 U	1.8 U
Vanadium	15.3	10.8	13	26.3	21.2	19	27.4	28.9	17.9	11.8	12.7
Zinc	18	8.5	31.8	160	12.3	11.5	19	25.8	64.4	25.8	31.8
Wet Chemistry											
% Solids (pct)	92	88	89	92	92	81	83	90	86	92	93
pH (ph)	6.3	5.3	6.6	7.9	6.9	6.4	NA	8.1	7.6	5.8	NA
Total organic carbon (TOC) (ug/g)	21,000 K	12,000 K	9,800 K	45,000 K	12,000 K	3,400 K	NA	12,000 K	14,000 K	20,000	NA

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

PH - pH units

UG/G - Micrograms per gram

UG/KG - Micrograms per kilogram

Appendix I
2010 Geophysical Survey of Three Penniman Plant Areas

NAeVA GEOPHYSICS INC.

THE LEADER IN SUBSURFACE DETECTION

Subsurface Geophysical Surveys

GPR
MAGNETICS
ELECTROMAGNETICS
SEISMICS
RESISTIVITY
UTILITY LOCATION
UXO DETECTION
BOREHOLE CAMERA
STAFF SUPPORT

GEOPHYSICAL INVESTIGATION REPORT

Naval Weapons Station Yorktown, Cheatham Annex Williamsburg, Virginia

Task Order CTO-0054

Date of Investigation:

April 1, 2010

Final Submittal
June 8, 2010

PREPARED FOR

CH2MHILL

5700 Cleveland Street, Suite 101
Virginia Beach, VA 23462

NEW YORK
225 N. Route 303
Suite 102
Congers
New York 10920
(845) 268-1800
(845) 268-1802 Fax

VIRGINIA
P.O. Box 7325
Charlottesville
Virginia 22906
(434) 978-3187
(434) 973-9791 Fax

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APPENDIX & CD

Appendix A: QC Test Results
Contents of CD: Project deliverables

ACRONYMS AND ABBREVIATIONS

AHA	Activity Hazard Analysis
ASCII	American Standard Code for Information Interchange
CD	Compact Disc
DGM	Digital Geophysical Mapping
FTP	File Transfer Protocol
GPS	Global Positioning Satellites
HAZWOPER	Hazardous Waste Operations and Emergency Response Standard
ISO	Industry Standard Object
MEC	Munitions and Explosives of Concern
mV	Millivolts
NAD83	North American Datum of 1983
NMEA	National Marine Electronics Association
NRL	Naval Research Laboratory
OSHA	Occupational Safety and Health Administration
QA	Quality Assurance
QC	Quality Control
SBAS	Satellite-Based Augmentation System
SOPs	Standard Operating Procedures
SOW	Scope of Work
TNT	Trinitrotoluene
UTM	Universal Transverse Mercator

1.0 INTRODUCTION

1.1 BACKGROUND AND OBJECTIVES

NAEVA Geophysics was contracted to perform one day of meandering path digital geophysical mapping (DGM) using an EM61-MK2 with sub-meter Global Positioning System (GPS) for positioning at Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The primary objective of the investigation was to identify metallic piping (if present) leading away from structures at four different locations (see **Figure 1**), the former Booster Test Pit building (previously referred to as the "fuze pit"), and three Area of Concern (AOC) 6 subareas (the Ammonia Settling Pits and the collocated Trinitrotoluene (TNT) Graining House Sump and TNT Catch Box Ruins). A CH2M HILL representative directed NAEVA as to which areas should be surveyed.

1.2 SCOPE OF WORK

NAEVA Geophysics provided personnel and geophysical survey equipment for the purpose of performing geophysical surveys at the aforementioned locations. Vegetation removal was not conducted prior to NAEVA's arrival at the site. However, limited vegetation clearance was performed by the CH2M HILL representative in advance of the data collector to limit brush catching on the operator and the equipment. Data was then collected in areas accessible with the EM61-MK2. All production data was processed, interpreted and delivered to the CH2M HILL Project Geophysicist on the schedule and in the formats specified in the DGM Scope of Work (SOW) (CH2M HILL, 2010).

1.3 SITE LOCATION AND DESCRIPTION

CAX is located on the site of the former Penniman Shell Loading Plant, which was a large powder and shell-loading facility operated during World War I. The Penniman facility closed in 1918 and between 1918 and 1923 was dismantled. Between 1923 and 1943, the property was either used for farming or left idle until CAX was commissioned in 1943 as a satellite unit of the Naval Supply Depot to provide bulk storage facilities and serve as an assembly and overseas shipping point throughout World War II.

2.0 EQUIPMENT

2.1 GEONICS EM61-MK2

The geophysical instrument used for the investigation at CAX was the Geonics EM61-MK2 metal detector. The EM61-MK2 is a high resolution time-domain electromagnetic instrument designed to detect, with high spatial resolution, shallow ferrous and non-ferrous metallic objects (Geonics,

2005). In comparison with other metal detectors, especially magnetometers, it is much better suited for work in close proximity to man-made structures and in areas of dense subsurface metallic debris.

The EM61-MK2 system consists of two 1 meter by 0.5 meter air-cored coils, a digital data recorder, batteries, and processing electronics. The EM61-MK2's transmitter generates a pulsed primary magnetic field, which then induces eddy currents in nearby metallic objects. The receivers either measure the eddy currents at three distinct time intervals in the bottom coil and one time interval in the top coil or four intervals in the bottom coil if no top coil measurements are recorded. For the work at CAX the latter method was chosen. Earlier time gates provide enhanced detection of smaller metallic objects. Secondary voltages induced in both coils are measured in millivolts (mV). The arrangement of coils is such that there is a vertical separation of 40 cm from the ground to the bottom coil. Based on the sub-meter accuracy of the GPS, target resolution of approximately 1.5 to 2 meters can be expected. The data are collected using Geonics' EM61-MK2 program and temporarily stored in a Juniper Allegro CX data logger prior to downloading to a laptop computer.

2.2 TRIMBLE GEOXH

Trimble's GeoXH sub-meter standalone (no base station) GPS was used to acquire positional data with the EM61-MK2. This alternative to centimeter accuracy GPS is better suited for use in areas with tree canopy and when the goal is characterization rather than target removal. The GeoXH consists of a handheld computer with an integrated internal GPS receiver and an external Zephyr antenna. This system is a 26-channel dual frequency receiver that uses L1, L2 and satellite-based augmentation system (SBAS) frequencies. For configuration with the EM61-MK2, the rover is set to output a NMEA (National Marine Electronics Association) GGA string at 1 Hz, which is captured into the NAV61MK2 program and temporarily stored on the Juniper Allegro CX.

3.0 METHODOLOGY

3.1 DGM SURVEY ACTIVITIES

No on-site activities were required prior to commencing DGM. The method of surveying for all locations was EM61-MK2 in wheel mode configuration.

3.1.1 Wheel Mode

In wheel mode, the EM61-MK2 bottom coil (which contains both a transmitter and receiver coil) is mounted on two manufacturer-supplied 40 cm wheels and has four plastic spacers which are used to separate the top coil from the bottom coil. A tripod for mounting the GPS antenna was attached to the top coil. Readings were collected at the standard rate of 10 per second.

3.1.2 Trimble GeoXH Global Positioning System

A Trimble GeoXH GPS system was used for the real-time acquisition of positional data during geophysical data collection. Readings were collected at a rate of 1 per second and the positional data were stored along with the EM61-MK2 readings in a single file on a Juniper Allegro handheld computer for later downloading and editing.

3.2 DATA PROCESSING AND INTERPRETATION

3.2.1 Data Storage and Initial Editing

EM61-MK2 data are temporarily stored in an Allegro data logger via Geonics's NAV61MK2 v1.22 software and then downloaded into a laptop computer for further on-site processing using Geonics's TrackMaker61MK2 software version 1.64a.

All daily logs, field notes, and sketches were input digitally into Hewlett Packard IPAQ personal digital assistant (PDA). At the end of each day, this information was uploaded in compressed format to the CH2M HILL project File Transfer Protocol (FTP) site for use in processing the geophysical data.

Initial data processing was performed by the field team which included reviewing data for integrity and repeatability.

3.2.2 Preprocessing

Converted raw data files were imported into Geosoft's Oasis Montaj to perform the following:

- Review and finalize all QC tests (cable shake, personnel and static) prior to processing of the DGM data for that day
- Projection of coordinates to North American Datum (NAD) 83 Universal Transverse Mercator (UTM) Zone 18 North coordinates
- Evaluate data density
- Apply auto leveling and instrument drift corrections
- Apply default lag correction
- Generate preliminary contour map(s) from gridded data
- Generate preliminary original vs. repeat profiles by grid block
- Generate formatted American Standard Code for Information Interchange (ASCII) files containing preprocessed data by grid block
- Generate Raw Data Delivery Reports in excel format

3.2.3 Final Processing

After completion of preprocessing, the data were further evaluated and processed to generate final processed data files. Final processing steps included:

- Evaluation and refinement of auto leveling and instrument drift corrections in the channel selected for analysis (Channel 3)
- Evaluation and refinement of lag correction in the channel selected for analysis (Channel 3)

- Additional digital filtering and enhancement, as necessary, in the channel selected for analysis (Channel 3)
- Generation of formatted ASCII files containing processed data by grid block
- Generation of final maps for AOC showing contoured gridded data and culture
- Generation of final original vs. repeat profiles by grid block
- Generation of Final Data Delivery Reports in excel format

3.2.4 Analysis and Target Selection

No individual targets were selected since the objective was to try to locate piping.

All raw, preprocessed, and processed data have been submitted to CH2M HILL's project geophysicist and can be found on the enclosed compact disc (CD) (see Contents of CD).

4.0 RESULTS

4.1 SUMMARY OF WORK PERFORMED

Meandering path digital geophysical mapping of CAX took place on April 1, 2010. The CAX DGM consisted of three grid blocks around: (1) the former Booster Test Pit building, (2) the Ammonia Settling Pits, and (3) the collocated TNT Graining House Sump and TNT Catch Box Ruins. DGM was completed in one working day. The site had heavy brush and required brush clearance in advance of the field team to create passable transects around the building ruins.

4.2 MOBILIZATION AND SITE SETUP

Prior to mobilization an Activity Hazard Analysis (AHA) and Standard Operating Procedures (SOPs) were provided to CH2M HILL, and all personnel had current 8-hour and/or 40-hour Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training.

NAEVA mobilized one field crew to Williamsburg, Virginia on March 31, 2010. DGM began at the site on April 1, 2010 and was completed the same day. A site-specific health and safety brief was given by the CH2M HILL site manager prior to the start of work. No equipment was staged on site.

4.3 DGM SURVEY ACTIVITIES

A total of 0.32 acres were mapped: 0.13 acres at the former Booster Test Pit building, 0.08 acres at the Ammonia Settling Pits, and 0.11 acres at the TNT Graining House Sump and Catch Box Ruins. No targets were selected as the survey was looking for pipes leading away from each of the building remains. Cultural objects noted on the site were reinforced concrete posts (**Figure 2**), a steel bollard on the surface (**Figure 3**) at the Ammonia Settling Pits, and a culvert (**Figure 4**) running beneath the road near the former Booster Test Pit building.

4.4 DATA PROCESSING AND INTERPRETATION

All data were processed as described in Section 3.2. Part of the process included analyzing channel decay in order to identify possible noise or other false positive responses. All recorded culture information is noted and identified on the individual grid block maps (**Figures 5 - 7**). There are several anomalies on the west and north sides of the Former Booster Test Pit Building that possibly represent piping leading away from the building since there is a linear trend across multiple transects (see red arrows on **Figure 5**). South of both the TNT Graining House Sump and the TNT Catch Box Ruins (**Figure 6**), anomalies are found on the nearest transect. However, there are no anomalies following the same linear trend on the adjacent transects. At the Ammonia Settling Pits (**Figure 7**), only a few anomalies were unexplained by culture debris on the surface and these were not representative of piping. Additionally, the high response areas to the north of the Ammonia Settling Pits are caused by reinforced concrete posts scattered throughout the area. Ambient and instrument noise levels at the CAX site were generally low.

Final data delivery reports list down-line data density statistics, leveling, lag, and gridding parameters used in processing each grid block. Overview mosaic maps are included as **Figures 8 and 9**.

5.0 QUALITY CONTROL

To establish confidence in the data reliability, Quality Control (QC) tests were conducted during the project. Tests were conducted prior to, during, and after all data collection sessions. All QC tests for the EM61-MK2 were conducted after a minimum 15 minute warm-up period for the electronics. Sample graphical displays of QC data are included in Appendix A.

5.1 QC TEST DESCRIPTIONS AND ACCEPTANCE CRITERIA

The following QC procedures were performed and documented during the data collection process and reviewed by a qualified geophysicist on a daily basis:

1. **Static Background and Static Spike:** Static tests were performed by positioning the survey equipment in an area free of metallic response and collecting data for a 3-minute period. During this time, the instrument was held in a fixed position. A static test is the primary measurement of instrument functionality and consists of one minute without a spike, one minute with a spike (a wooden board fitted to the bottom coil with a small Industry Standard Object (ISO) suspended 48 centimeters above it), and then one minute without a spike. The ISO that was used for this survey was a 1 inch by 4 inch steel pipe (part # 4415K466) from the McMaster –Carr on-line catalog (http://www.mcmaster.com/). The purpose of the static

test is to determine whether unusual levels of instrument or ambient noise exist. Acceptance criteria of ± 20% of the spike response after background correction were compared to instrument response curves for this ISO. These curves were developed by the Naval Research Laboratory (NRL) (Nelson, et al, 2009). The static background and static spike tests were conducted at the beginning and end of each grid block.

2. **Cable Shake Test:** At the beginning of the day, the instrument connections were checked for their response to vibrations in the cables. The response was observed in the field for immediate corrective action, transmitted back to a processor, analyzed, and checked for spikes in the data that can possibly create false anomalies. The cable shake test was conducted at the beginning of the survey operation for each workday, and cables were not disconnected during the day.

3. **Personnel Test:** This test checks the response of instruments to personnel and their clothing/proximity to the system. At the beginning of the day, the instrument was checked for its response to the personnel operating the system. The response was observed in the field for immediate corrective action and transmitted back to a processor, analyzed, and checked for spikes in the data that can possibly create false anomalies. The personnel test was conducted at the beginning of the survey operation for each workday.

5.2 QC TEST RESULTS

QC data were evaluated using Geosoft's Quality Assurance (QA)/Quality Control software. Static, cable shake, and personnel test profiles were plotted with a criterion of ± 2 mV from the mean in channel 3. The following provides a summary of the QC results:

1. **Static Background / Spike Test:** All static and spike tests were within acceptance criteria; stable, repeatable, and without spikes.

2. **Cable Shake Test:** No spikes were observed in any of the tests.

3. **Personnel Test:** No deviation from background response was observed.

All QC tests were well within acceptance criteria and were conducted in the vicinity of the grid block.

6.0 CONCLUSIONS

All tasks involved in the DGM of the four sites at Cheatham Annex were completed as scoped. Supporting QC data and all other DQO's as outlined in the geophysical investigation plan were

within specifications. The survey was completed in one day and covered 0.32 acres in three grid blocks.

In general, anomaly density was low for all three sites with the majority of the unexplained anomalies occurring at the Former Booster Test Pit Building Area. The TNT Catch Box Ruins, the TNT Graining House Sump and the Ammonia Settling Pits do not show any indication of underground piping. It is possible on the west and north side that underground piping exists based at the three linear trends leading away from the Former Booster Test Pit Area. However, all possible linear trends are based on only two anomalies and it is very easy to turn any two points into a line. To confirm the actual existence of piping at the Former Booster Test Pit Area there are two options. One is to conduct additional surveying to confirm that a linear trend does exist by detecting additional anomalies along the trend. If the additional surveying proves that a linear trend does exist then intrusively investigate the linear anomalies. Or two, just intrusively investigate the three possible linear trends without further geophysical surveying.

7.0 REFERENCES

CH2M HILL. 2010. *Clean 1000 CTO-0054, Scope of Work, Digital Geophysical Mapping Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, VA.* March.

Geonics Limited. 2005. *EM61-MK2 and EM61-MK2HP 4 Channel High Sensitivity Metal Detectors Operating Manual.* July.

Nelson, H.H., T. Bell, J. Kingdon, N. Khadr, and D. Steinhurst. 2009. *EM61-MK2 Response of Three Munitions Surrogates. NRL/MR/6110-09-9183*. March

FIGURES

Legend

Area of Concern (AOC) for DGM

100 0 100 200 300 400

(meters)

NAD83 / UTM zone 18N

NAEVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Figure 1

CH2M HILL

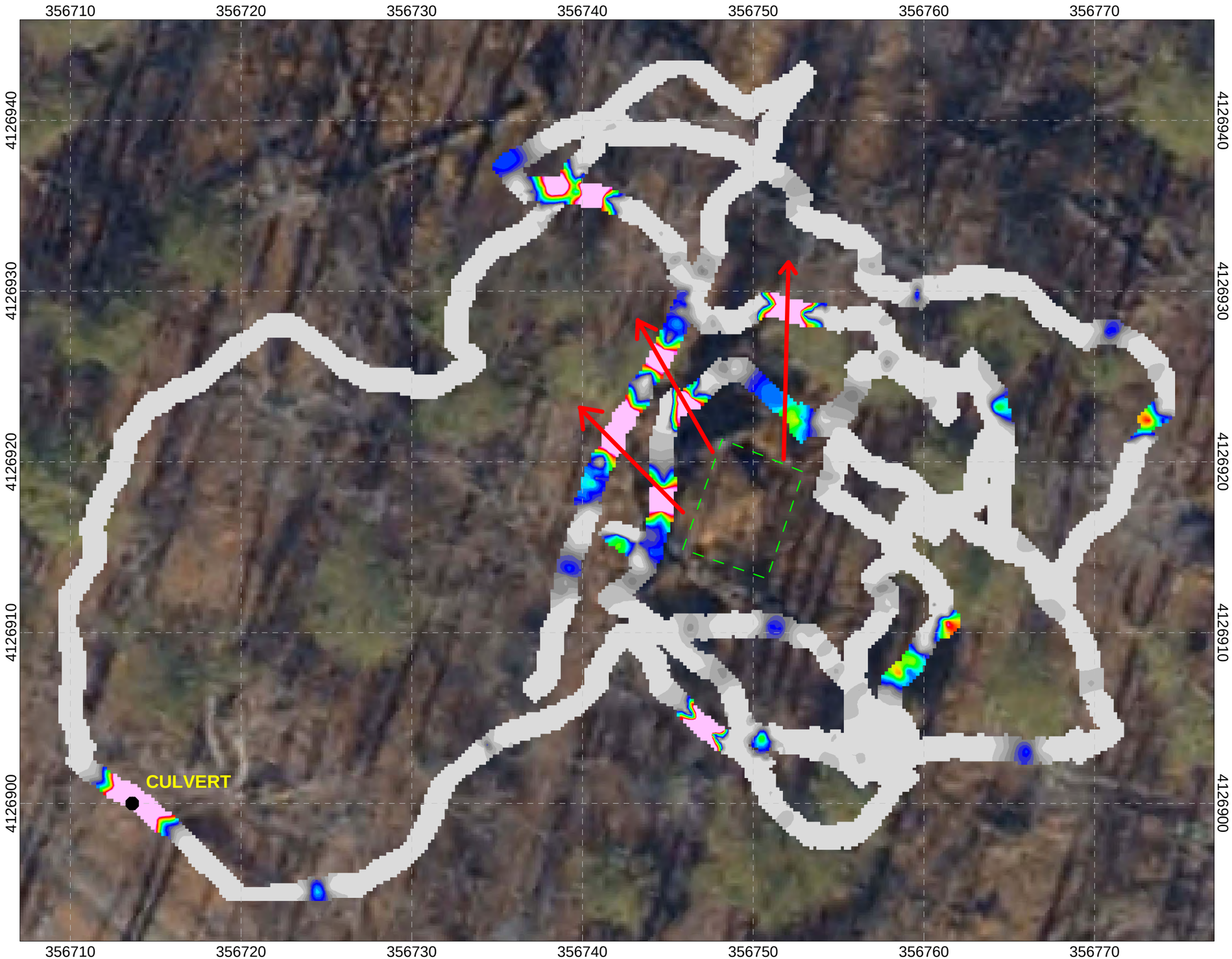
Overview of Digital Geophysical Mapping (DGM)
Naval Weapons Station Yorktown
Cheatham Annex, Virginia

Date of Survey: 04/01/2010

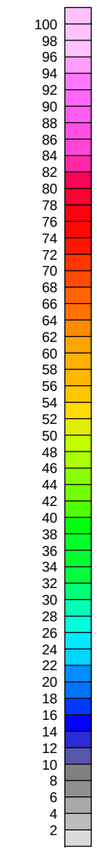
Figure 2: Reinforced Concrete near Ammonia Settling Pits

Figure 3: Steel Bollard on Surface within Ammonia Settling Pits

Figure 4: Culvert beneath road at Booster Test Pit area



NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys



Legend

brush
Culture (if noted)

Former Building Location (Approximate)

Possible Linear Trends

2.5 0 2.5 5 7.5 10 12.5 15
(meters)
NAD83 / UTM zone 18N

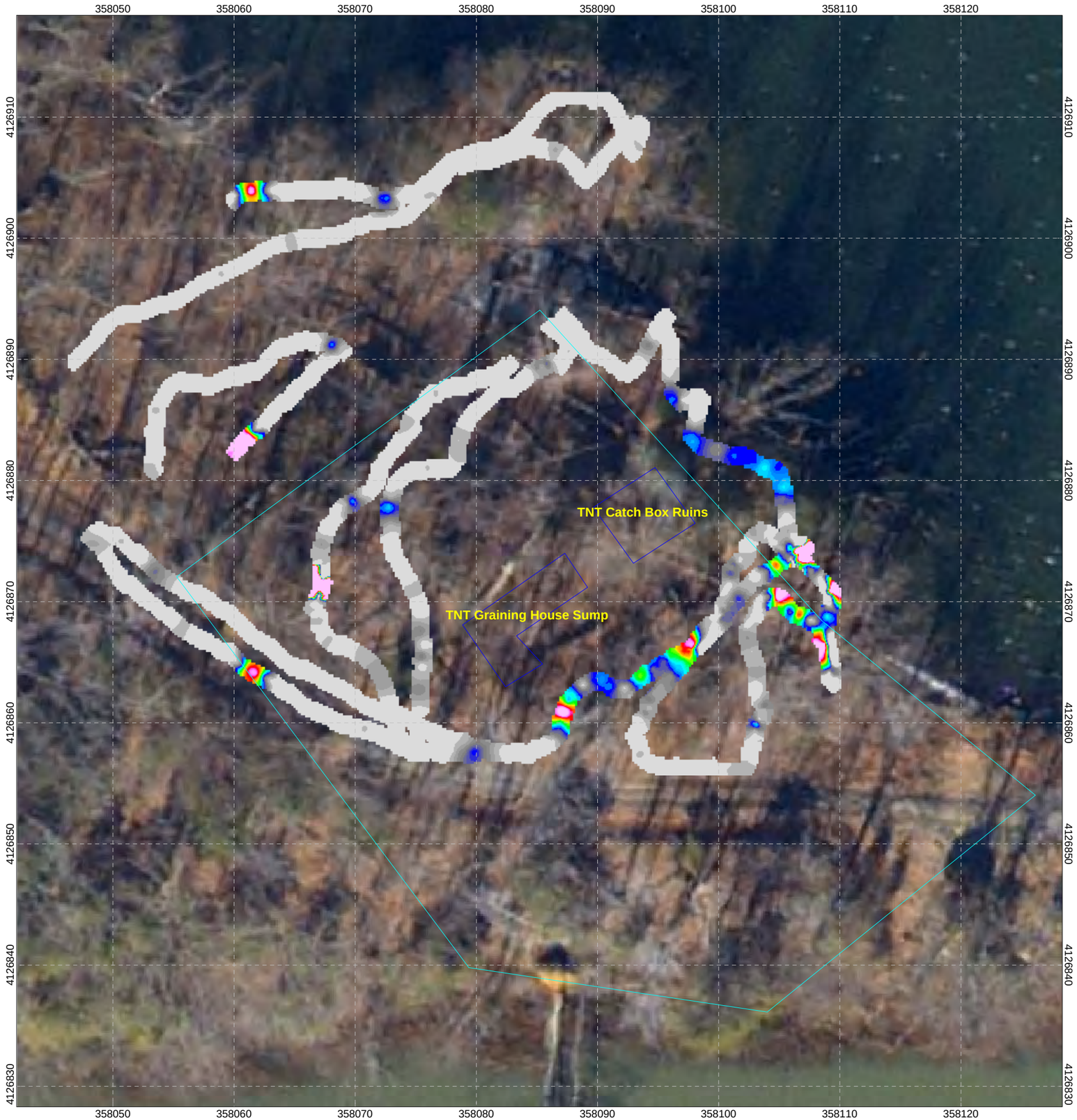
Figure 5

Client: CH2M HILL

EM61 MK2 Bottom Coil
Former Booster Test Pit Building Area
NWS Yorktown - Cheatham Annex, Virginia

Date of Survey 04/01/2010
Date of Creation 04/09/2010

Map Approver: Jon Guillard



NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

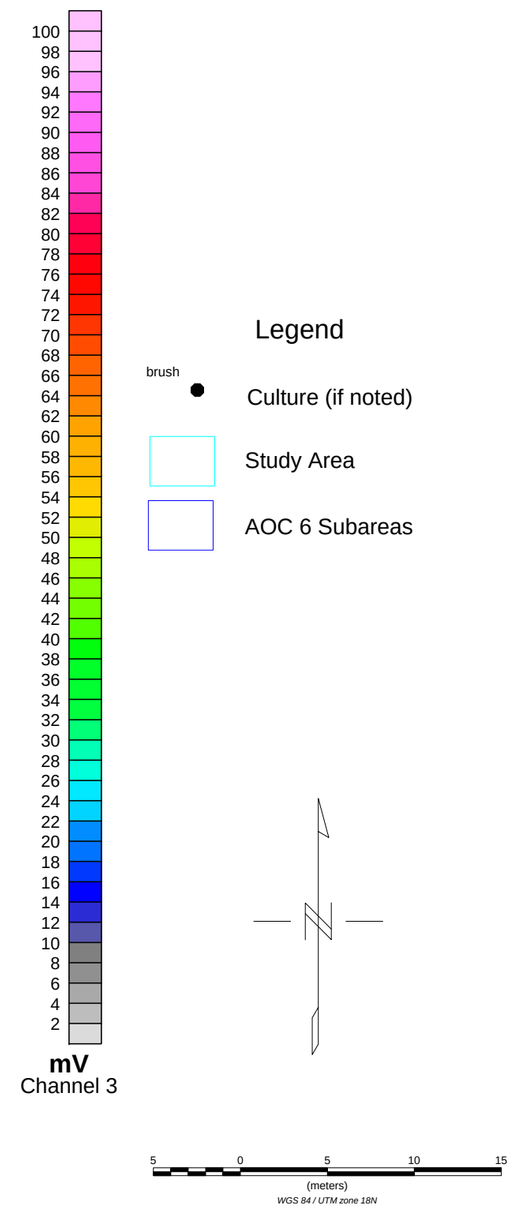


Figure 6

Client: CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: TNT Graining House Sump and TNT Catch Box Ruins NWS Yorktown - Cheatham Annex, Virginia
Date of Survey 04/01/2010 Date of Creation 04/09/2010
Map Approver: Jon Guillard

NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

brush
- Culture (if noted)
- Vent
- Reinforced Concrete
- Study Area
- AOC 6 Subareas

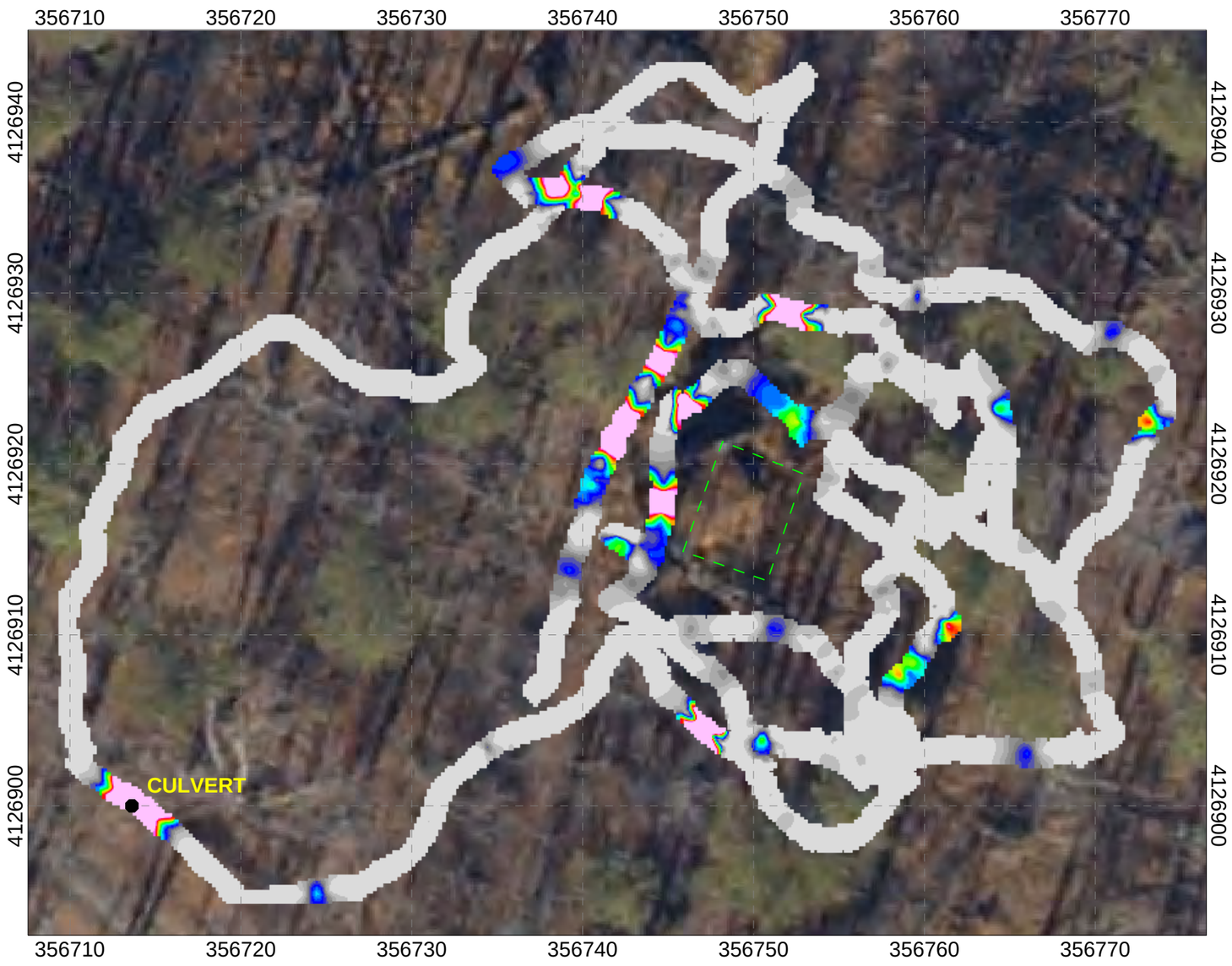
100, 98, 96, 94, 92, 90, 88, 86, 84, 82, 80, 78, 76, 74, 72, 70, 68, 66, 64, 62, 60, 58, 56, 54, 52, 50, 48, 46, 44, 42, 40, 38, 36, 34, 32, 30, 28, 26, 24, 22, 20, 18, 16, 14, 12, 10, 8, 6, 4, 2

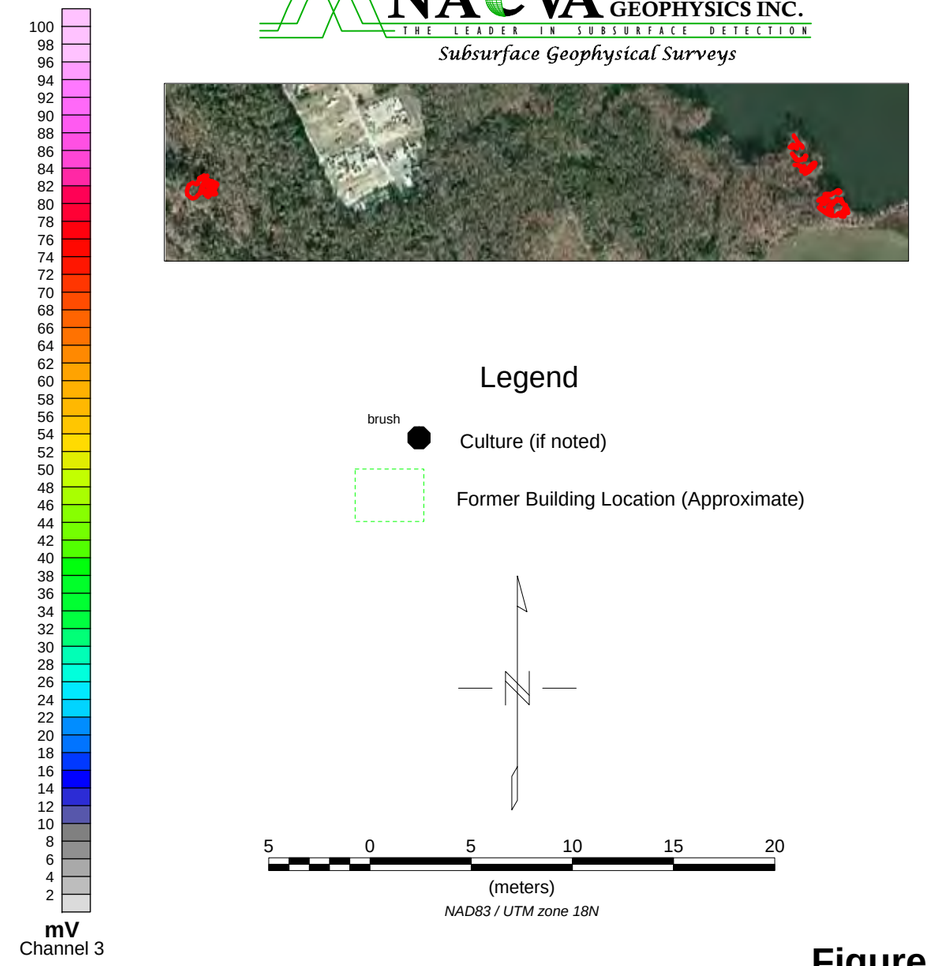
mV
Channel 3

5 0 5 10 15 20
(meters)
NAD83 / UTM zone 18N

Figure 7

Client: CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: Ammonia Settling Pits NWS Yorktown - Cheatham Annex, Virginia
Date of Survey 04/01/2010 Date of Creation 04/09/2010
Map Approver: Jon Guillard





NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys

Legend

brush

Culture (if noted)

Former Building Location (Approximate)

5 0 5 10 15 20

(meters)

NAD83 / UTM zone 18N

Figure 8

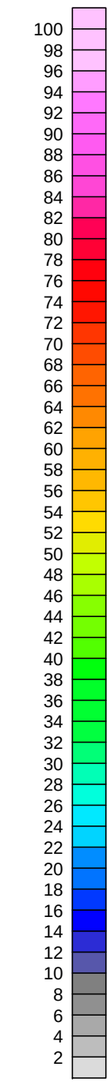
CH2M HILL

EM61 MK2 Bottom Coil
Former Booster Test Pit Building Area Mosaic
NWS Yorktown - Cheatham Annex, Virginia

Date of Creation 04/09/2010

Map Approver: Jon Guillard

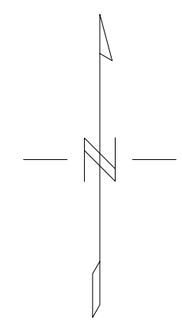
NAeVA GEOPHYSICS INC.
THE LEADER IN SUBSURFACE DETECTION
Subsurface Geophysical Surveys



Legend

brush

- Culture (if noted)
- Vent
- Reinforced Concrete
- Study Area
- AOC 6 Subareas



10 0 10 20 30 40 50
(meters)
NAD83 / UTM zone 18N

Figure 9

CH2M HILL
EM61 MK2 Bottom Coil AOC 6 Subareas: Ammonia Settling Pits, TNT Graining House Sump and TNT Catch Box Ruins Mosaic NWS Yorktown - Cheatham Annex, Virginia
Date of Creation 04/09/2010
Map Approver: Jon Guillard

APPENDIX A:

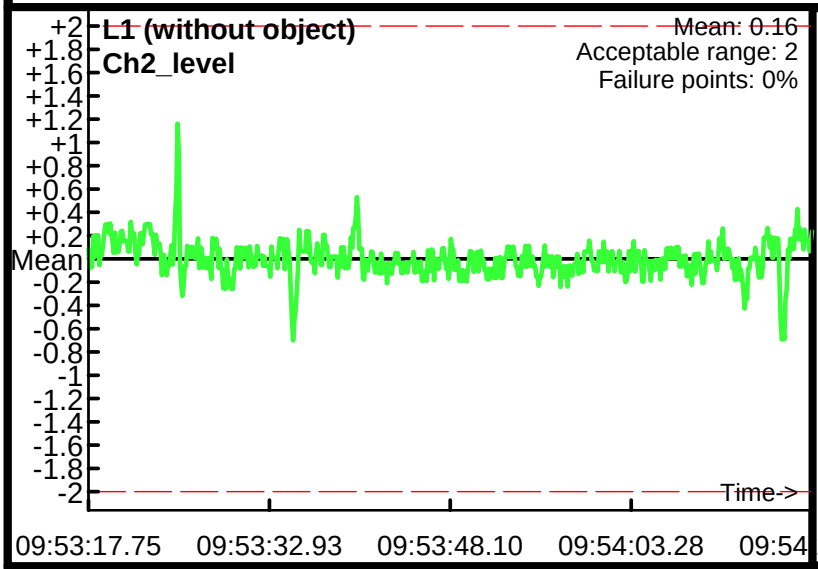
QC Test Result

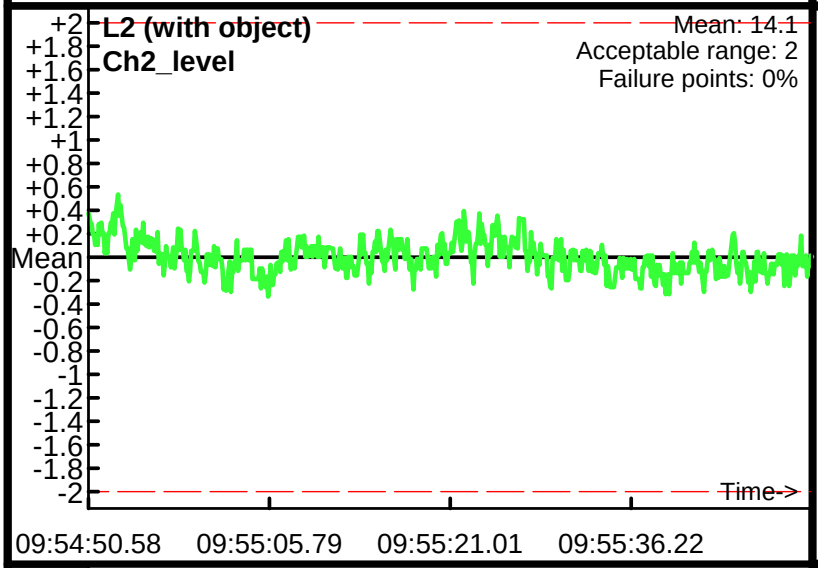
Static Calibration Test

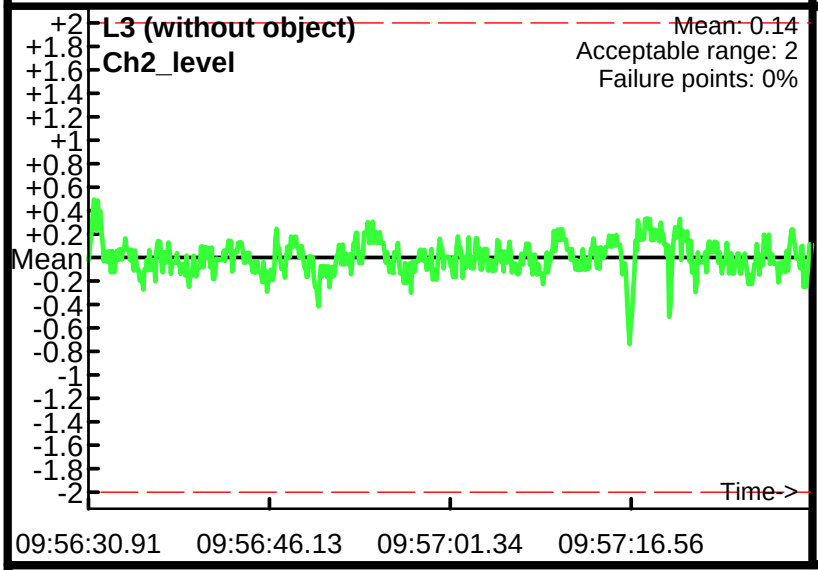
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010







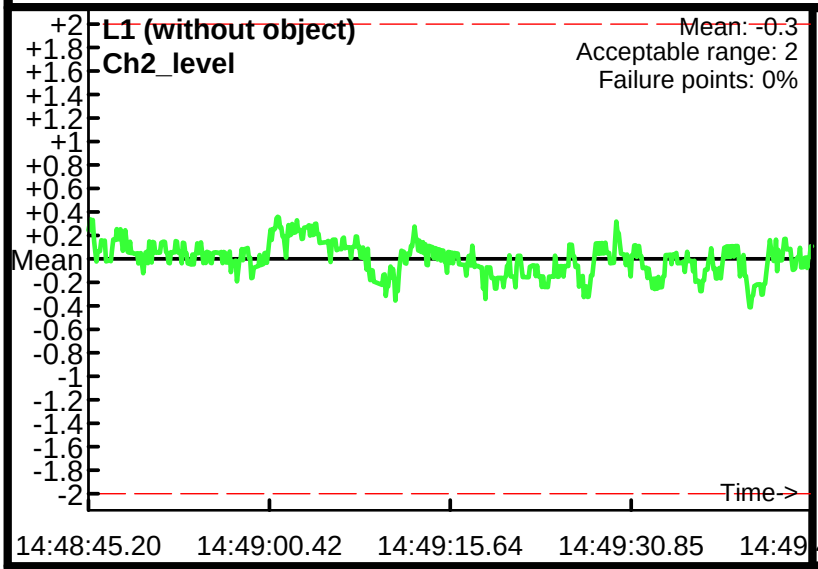
Database: q:\virginia office\ch2m hill\cheatham annex\Data\Geosoft\QC\0401QC\0401QC1.gdb
Line Name: L1 L2 L3

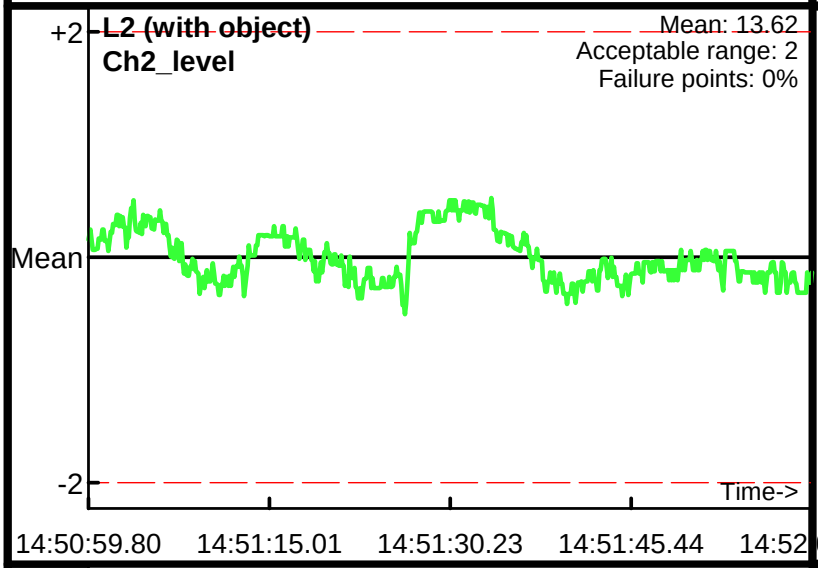
Static Calibration Test

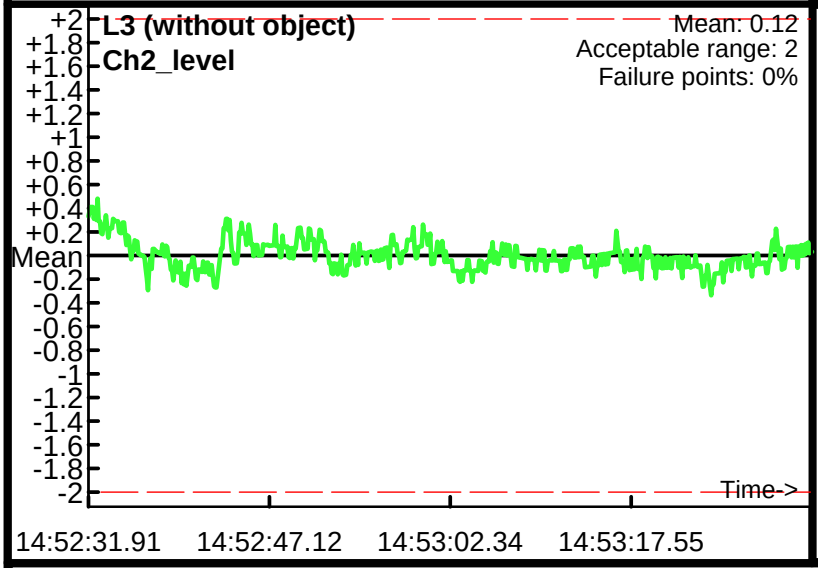
Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-3

Outside range
Acceptable limits

PM test
Operator: GeoA
Date: 4/1/2010







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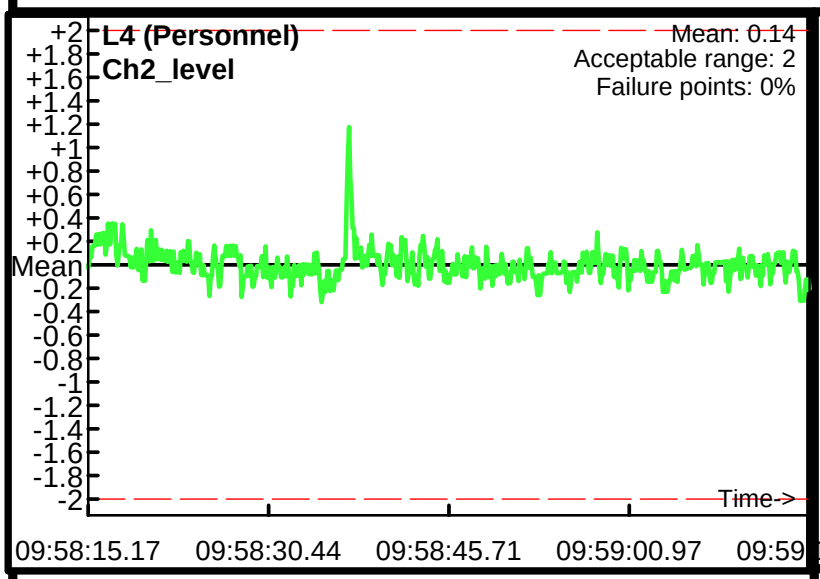
Line Name: L1 L2 L3

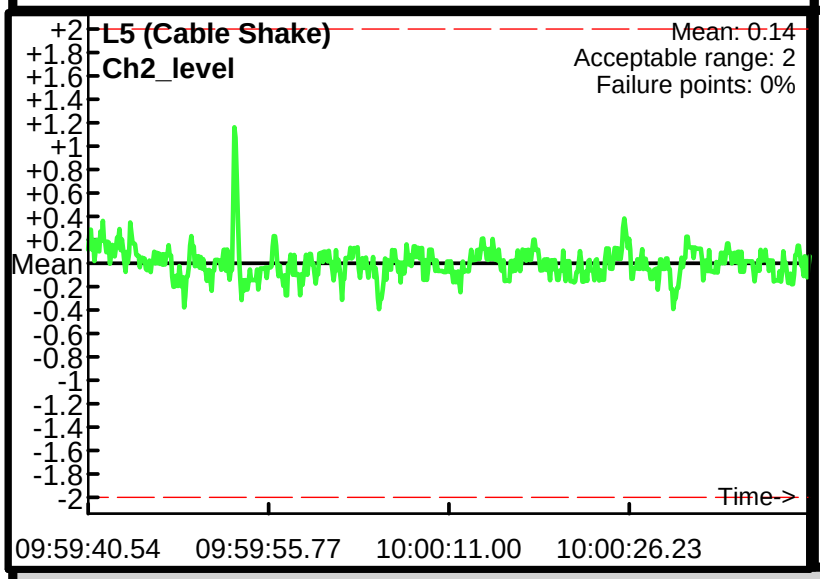
Personnel & Cable Shake Tests

Project: NWS Yorktown - Cheatham Annex
Equipment: EM-61 Mark II
Grid/Location: 0401T-1

Outside range
Acceptable limits

AM test
Operator: GeoA
Date: 4/1/2010





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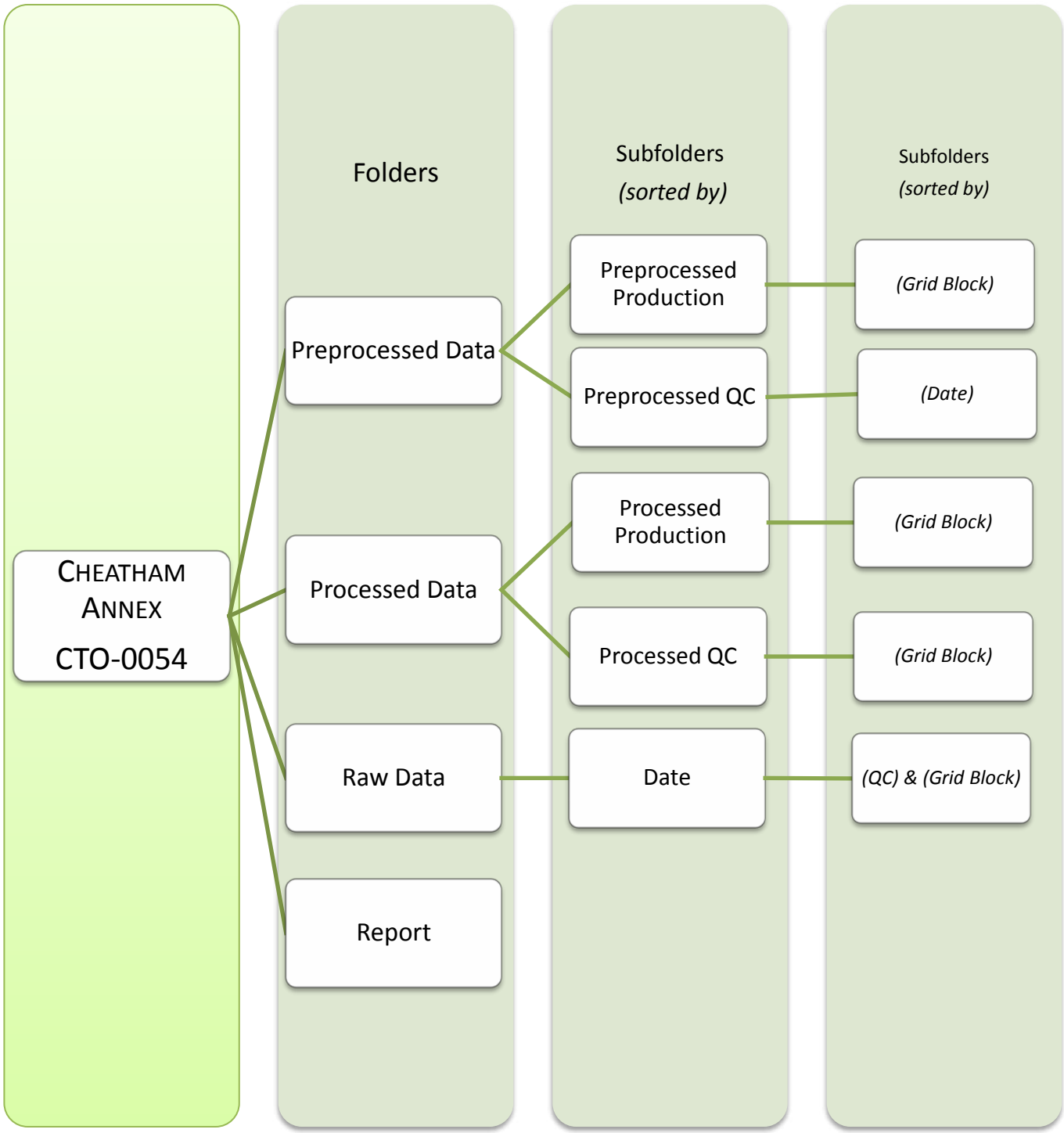
Line Name: L4 L5 L5

CONTENTS of CD

CONTENTS OF CD



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Cardstock + adhesive CD envelope

or CD sleeve

Appendix J
Summary of AOC 7 and AOC 8 SI Test Pitting Activities

AOC 7

AOC 7 - SI Test Pitting Activities

Test pitting activities were conducted between October 30 and 31, 2008 at 10 locations (CAA07-SO02 and CAA07-TP01 through CAA07-TP09) to delineate the extent of debris at AOC 7 (**Figure 6-3**). Two initial test pit locations were chosen based on the historical presence of surface debris; within the Can Pit (CAA07-SO02) and the former Drum Disposal Area (CAA07-TP09). Additional test pits were advanced directly north, south, east, and west of the initial test pits (CAA07-TP01 through CAA07-TP08) to confirm the extent of debris present, if any. Test pits were advanced to a maximum depth of 10 feet or until native soil was encountered.

CAA07-SO02 (Can Pit)

The Can Pit consists of a depression approximately 30 feet long, 20 feet wide and 4 feet deep. Rusted, flakey, metal shards were encountered at the bottom of the depression. Prior to excavation, a surface sample was collected at the top of the Can Pit (CAA07-SS02). During excavation, numerous amber glass bottles and 4-inch tall clear bottles were encountered 1 to 2 feet below the initial surface of the Can Pit. This debris extended to a depth of approximately 10 to 12 feet below the top of the Can Pit (or 14 to 16 feet bgs). Test pit excavation continued until 16 feet bgs, where native soil was confirmed and sampled (CAA07-SB02). Following the completion of test pitting activities, excavated soil was backfilled and regraded to the original depth.

CAA07-TP01

CAA07-TP01 was excavated on October 30, 2008, to the north of the Can Pit to a depth of 10 feet bgs. No debris was encountered during the excavation. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP02

CAA06-TP02 was excavated on October 30, 2008, to the west of the Can Pit to a depth of 10 feet bgs. No debris was encountered during the excavation. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP03

CAA07-TP03 was excavated on October 30, 2008, to the south of the Can Pit to a depth of 10 feet bgs. No debris was encountered during the excavation. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP04

CAA07-TP04 was excavated on October 30, 2008, to the east of the Can Pit to a depth of 10 feet bgs. Prior to excavation, co-located surface and subsurface soil samples (CAA07-SS05 and CAA-07-SB05) were collected from ground surface. No debris was encountered during the excavation. An additional subsurface sample (CAA07-SBTP04-1008) was collected from the bottom of the test pit. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP05

CAA07-TP05 was excavated on October 31, 2008, to the west of CAA07-TP09 to a depth of 10 feet bgs. Prior to excavation, co-located surface and subsurface soil samples (CAA07-SS07 and CAA-07-SB07) were collected from ground surface. No debris was encountered during the excavation. An additional subsurface sample (CAA07-SBTP05-1008) was collected from the bottom of the test pit. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP06

CAA07-TP06 was excavated on October 31, 2008, to the south of CAA07-TP09 to a depth of 10 feet bgs. Prior to excavation, co-located surface and subsurface soil samples (CAA07-SS06 and CAA07-SB06) were collected from ground surface. No debris was encountered during the excavation. An additional subsurface sample (CAA07-SBTP06-1008) was collected from the bottom of the test pit. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP07

CAA07-TP07 was excavated on October 31, 2008, to the east of CAA07-TP09 to a depth of 10 feet bgs. No debris was encountered during the excavation. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP08

CAA07-TP08 was excavated on October 31, 2008, to the north of CAA07-TP09 to a depth of 10 feet bgs. No debris was encountered during the excavation. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA07-TP09 (Drum Disposal Area)

CA007-TP09 was excavated on October 31, 2008, within the Drum Disposal Area. Prior to excavation, co-located surface and subsurface soil (CAA07-SS03 and CAA07-SB03) and groundwater (CAA07-DW03) were collected from ground surface. Excavation extended to a depth of 10 feet bgs. No debris was encountered during the excavation. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

AOC 8

AOC 8 - SI Test Pitting Activities

Test pitting was conducted in October 2008 at 27 locations—CAA08-TP01 through CAA08-TP26 and CAA08-TP10A—across AOC 8 based on existing test pit data (Baker, 2001), visible debris on the ground surface, and Shonstat® magnetometer readings taken across the site. Test pitting was conducted across the entire site, but focused primarily on the northwestern corner of the AOC 8, where visible debris was identified in abundance (**Figure 7-3**). Based on the specifications of the SI Work Plan (CH2M HILL, 2008), test pits were initially advanced to a maximum depth of 10 feet bgs or until native soil was encountered. However, during pitting activities, it was discovered that what was initially believed to be native soil was additional fill material that had been present long enough to develop soil horizons and leaching characteristics similar to native soils. On October 24, 2008, excavation activities were amended to continue to the depth at which debris ended or to 20 feet bgs, the maximum extent of the excavator's reach. In some instances, debris continued below20 feet bgs. Several test pits were re-examined to these new depth. Three soil samples were collected at the bottom of the test pits considered to have the greatest amount of observed debris.

CAA08-TP01

CAA08-TP01 was excavated on October 22, 2008, adjacent to the southeastern most berm to a total depth of 2 feet bgs. Thick metal wire was encountered at approximately 2 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP02

CAA08-TP02 was excavated on October 22, 2008, adjacent to the southern berm to a total depth of 2 feet bgs. A metal cable was encountered at 2 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP03

CAA08-TP03 was excavated on October 22, 2008, based on a response from the Shonstat® magnetometer to a total depth of 3 feet bgs. Test pitting ceased after no source for the response from the Shonstat® was found to a depth of 3 feet bgs. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP04

CAA08-TP04 was excavated on October 22, 2008, based on surface debris consisting of wood, concrete, and metal piping to an approximate total depth of 3 feet bgs. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, the excavation hole was left open.

CAA08-TP05

CAA08-TP05 was excavated on October 22, 2008, based on surface debris to a total depth of 3 feet bgs. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded. The Test Pit was revisited on October 27, 2008, based on the amended test pitting specifications and excavated to a total depth of 20 feet bgs. No additional debris was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP06

CAA08-TP06 was excavated on October 22, 2008, adjacent to western berm wall to a total depth of 3 feet bgs. Metal piping was encountered from 2 to 3 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, all soil and waste was backfilled and regraded. The Test Pit was revisited on October 27, 2008, based on the amended test pitting specifications and excavated to a total depth of 20 feet bgs. Only a small piece of concrete and scrap metal were encountered within the side of the berm. Following the completion of test pitting activities, excavated soil and waste was backfilled and regraded.

CAA08-TP07

CAA08-TP07 was excavated on October 22, 2008, adjacent to northern berm wall to a total depth of 3 feet bgs. Metal fencing was encountered at 3 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, all soil and waste was backfilled and regraded. The Test Pit was revisited on October 27, 2008, based on the amended test pitting specifications and excavated to a total depth of 20 feet bgs. No additional debris was identified below 3 feet bgs. Following the completion of test pitting activities, excavated soil and waste was backfilled and regraded.

CAA08-TP08

CAA08-TP08 was excavated on October 22, 2008, adjacent to northern berm wall to a total depth of 3 feet bgs. Metal fencing was encountered at 3 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, excavated soil and waste was backfilled and regraded.

CAA08-TP09

CAA08-TP09 was excavated on October 23, 2008, in the northern bank of the largest, eastern depression to a total depth of 3 feet bgs. Concrete, metal piping, a hard hat, scrap metal, metal bars, bricks, burned and unburned wood, nails, burlap, and plexiglass shards were identified interspersed within the first 3 feet of excavated soil with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, excavated soil and waste was backfilled and regraded. The test pit was revisited on October 24, 2008, based on the amended test pitting specifications and excavated to a total depth of 20 feet bgs, the depth the water table was encountered. No additional debris was identified below 3 feet bgs. Following the completion of test pitting activities, excavated soil and waste was backfilled and regraded.

CAA08-TP10

CAA08-TP10 was excavated on October 23, 2008, within the center of the largest, eastern depression to a total depth of 4 feet bgs. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP10A

CAA08-TP10A was excavated on October 23, 2008, to a total depth of 4 feet bgs. The result of test pitting at Test Pit 10A was initially omitted from the fieldbook due to error and was later added subsequent to the completion of additional test pits. The test pit was labeled as Test Pit 10A to maintain the chronology of the test pits in the fieldbook. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP11

CAA08-TP11 was excavated on October 23, 2008, from the top of a low lying area to a total depth of 4 feet bgs. A few scattered pieces of metal rods, bricks, and lumber were encountered to a depth of 4 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP12

CAA08-TP12 was excavated on October 23, 2008, adjacent to the northern berm to a total depth of 3 feet bgs. Scrap metal, lumber, plastic from a tail light, and a hatch cover were encountered to a depth of 3 feet bgs with no additional debris beneath. Test pitting ceased after clean soil indicative of native soil was identified. Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP13

CAA08-TP13 was excavated on October 23, 2008, in the central most portion of the site to a total depth of 3 feet bgs. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, all soil was backfilled and regraded. The test pit was revisited on October 24, 2008, based on the amended test pitting specifications and excavated to a total depth of 18 feet bgs. Small debris including concrete blocks, nails, and various metal debris were encountered from 5 to 6 feet bgs. No additional debris was encountered to a depth of 18 feet bgs, at which the water table was encountered and the test pit collapsed. Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP14

CAA08-TP14 was excavated on October 23, 2008, based on metal surface debris to a total depth of 20 feet bgs. Debris consisting of chains, metal piping, glass, plexiglass, burlap, bricks, nails, burned rope, plastic bottles, lumber, a heavy spring, and various unidentifiable pieces of steel debris were encountered from ground surface down to native soil encountered at 20 feet bgs. At 20 feet bgs, a soil sample was collected (CAA08-SBTP14-1008). Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP15

CAA08-TP15 was excavated on October 23, 2008, adjacent to the outside wall of the northern berm to a total depth of approximately 3 feet bgs. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP16

CAA08-TP16 was excavated on October 23, 2008, adjacent to the outside wall of the northern berm to a total depth of approximately 3 feet bgs. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP17

CAA08-TP17 was excavated on October 23, 2008, adjacent to the outside wall of the northern berm to a total depth of approximately 3 feet bgs. Test pitting ceased after no debris or apparent fill material was identified. Following the completion of test pitting activities, excavated soil was backfilled and regraded. The test pit was revisited on October 27, 2008, based on the amended test pitting specifications and excavated to a total depth of 20 feet bgs. No additional debris was encountered. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP18

CAA08-TP18 was excavated on October 23, 2008, adjacent to the inside wall of the northern berm to a total depth of 5 feet bgs. Heavy debris was encountered including scrap metal, concrete, and steel plates were encountered to the depth of 5 feet bgs. At approximately 5 feet bgs, an unidentified chalky turquoise blue powder was encountered. Due to the concern that this powder may represent a material potentially posing an explosive hazard (MPPEH), the project manager and qualified unexploded ordnance technician were contacted. It was determined that the material likely does not represent MPPEH; however, the decision was reached to cease excavation and place soil and debris back into the test pit without collecting a soil sample.

CAA08-TP19

CAA08-TP19 was excavated on October 23, 2008, in the northern bank of the central low lying area to a total depth of 4 feet bgs. At 2 feet bgs, shelly hash indicative of native soil was first encountered and test pitting ceased when no debris was encountered after 4 feet bgs. Following the completion of test pitting activities, all soil was backfilled and regraded. The test pit was revisited on October 24, 2008, to a total depth of 20 feet bgs based on the amended test pitting specifications. Clean soil was observed until a depth of approximately 15 feet bgs, at which point metal debris and steel cylinders were encountered. One metal container was found to be leaking an unidentified black substance. Excavation continued to a depth of 20 feet bgs, where a soil sample was collected (CAA08-SBTP19-1008). Following the completion of test pitting activities, all soil and waste was backfilled and regraded.

CAA08-TP20

CAA08-TP20 was excavated on October 23, 2008, between Test Pits 18 and 19 to a total depth of 4 feet bgs At 2 feet bgs, shelly hash indicative of native soil was first encountered

and test pitting ceased when no debris was encountered after 4 feet bgs. Following the completion of test pitting activities, all soil was backfilled and regraded.

CAA08-TP21

CAA08-TP21 was excavated on October 23, 2008, between Test Pits 18 and 20 to a total depth of 20 feet bgs. Debris similar to that observed at Test Pit 14 was observed beginning at approximately 16 feet bgs. At 20 feet bgs, the same blue powder observed at Test Pit 18 was encountered in the form of a solid disk. As was determined with Test Pit 18, the material likely does not represent MPPEH; however, the decision was reached to cease excavation and place soil and debris back into the test pit. Although significant amounts of debris were identified, no soil sample was collected because the bottom of the debris was not reached.

CAA08-TP22

CAA08-TP22 was excavated on October 24, 2008, to a total depth of 20 feet bgs. Soil encountered during test pitting consisted entirely of sandy fill material to a depth of 20 feet bgs, at which point the water table was encountered. Test pitting ceased after clean soil indicative of native soil was encountered and the maximum reach of the excavator was exceeded. Following the completion of test pitting activities, all excavated soil was backfilled and regraded.

CAA08-TP23

CAA08-TP23 was excavated on October 24, 2008, adjacent to the inside wall of the southeastern berm to a total depth of 20 feet bgs. Soil encountered during test pitting consisted entirely of sandy fill material to a depth of 20 feet bgs, at which point the water table and soil characteristics indicative of the Yorktown Aquifer were encountered. Test pitting ceased after clean soil indicative of native soil was encountered and the maximum reach of the excavator was exceeded. Following the completion of test pitting activities, all excavated soil was backfilled and regraded.

CAA08-TP24

CAA08-TP24 was excavated on October 27, 2008, based on scrap metal debris observed on the surface to a total depth of 20 feet bgs. Scrap metal debris extended from the ground surface to a depth of 6 feet bgs. Clean soil was observed from 6 to 14 feet bgs, at which point a second layer of debris consisting of wire, cable, and various metal debris was encountered. The second layer of debris continued until approximately 19 feet bgs. Excavation continued to a depth of 20 feet bgs, where a soil sample (CAA08-SBTP24-1008) was collected for analysis. Test pitting ceased after clean soil indicative of native soil was encountered. Following the completion of test pitting activities, all excavated soil and waste was backfilled and regraded.

CAA08-TP25

CAA08-TP25 was excavated on October 28, 2008, adjacent to the outside wall of the western berm to a total depth of 20 feet bgs. Test pitting ceased after no debris was encountered and the maximum reach of the excavator was exceeded. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

CAA08-TP26

CAA08-TP26 was excavated on October 28, 2008, adjacent to the outside wall of the northeastern berm to a total depth of 20 feet bgs. Test pitting ceased after no debris was encountered and the maximum reach of the excavator was exceeded. Following the completion of test pitting activities, excavated soil was backfilled and regraded.

References

Baker. 2001. *Final Field Investigation Report, Site 7 and AOC 2, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia.* March.

CH2M HILL. 2008. *Final Work Plan for Site Investigation of Various Areas of Concern, Naval Weapons Station Yorktown Cheatham Annex, Williamsburg, Virginia*. October.

1 – VDEQ's Comments on the Draft SI Report

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

September 15, 2011

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

RE: Draft Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Naval Weapons Station Yorktown
Cheatham Annex
Williamsburg, Virginia

Dear Ms. Parra:

The Virginia Department of Environmental Quality (DEQ) has received the *Draft Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8* (SI Report) for Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The June 2011 SI Report, prepared by CH2M HILL, was received by the DEQ on July 5, 2011.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced SI Report. Subsequent to DEQ's internal review and per CAX Partnering Team discussions, this office has no comments at this time, but cannot provide concurrence until EPA's comments are responded to and discussed with the CAX Partnering Team as planned.

Please contact me at (804) 698-4125 or wade.smith@deq.virginia.gov with any additional questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Office of Remediation Programs

cc: John Burchette, EPA

2 – USEPA's Comments on the Draft SI Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

August 15, 2011

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Comments on the Draft Site Inspection Report: Areas of Concern 1,2,6,7 and 8.

Ms. Parra:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

EPA RPM General Comment 1: There are a multiple instances in this document that are inconsistent with EPA Guidance and some revisions will need to be made or an explanation should be provided as to why they would be appropriate. Examples would be: averaging groundwater samples, applying dilution attenuation factors directly to groundwater samples (typically DAFs are used for and applied to soil migration to groundwater), screening risks from individual chemical against the 5x10-5 cancer and 0.5 HQ screening level (should be cumulative risk for the site not on a per chemical basis), and taking the mean HQ of soil samples and screening them out.

Further, much of the above is not consistent with the Human Health Screening Methodology (A.2) in Appendix A of this document.

EPA RPM General Comment 2: A number of chemicals which did not have screening values were screened out by being compared to screening values of other similar explosives. Please provide the actual compound they were compared to, the actual screening value used, and how that number was developed. Please revise each instance of this in the document for transparency purposes (note that not all instances of this are noted in the comments).

EPA RPM General Comment 3: Please include risk screening tables similar to the Example Risk Screening tables (attached) at the end of each Section for transparency purposes. These tables should include all COPCs that passed through the screening process.

Section 2
EPA RPM Comment 1: Page 2-1. Although the investigation methodology etc… from the previous investigation are not included in the report, I assuming all sample data are. Correct?

Section 3
EPA RPM Comment 2: Page 3-13. This is an incorrect application of dilution attenuation factors. DAF are utilized the project what we may see in groundwater from a soil sample value. Applying a DAF directly to a groundwater sample makes no sense and is not consistent with EPA guidance. Please revise.

EPA RPM Comment 3: Page 3-15. Groundwater. It is unclear as to why we would average groundwater samples. Wells should be evaluated on a per well basis.

EPA RPM Comment 4: Page 3-17. Eco Risk Evaluation. Eco Risks should be calculated for these sites. Although the size of the sites may be small, they are essentially all habitat (forested cover etc… not a parking lot).

EPA RPM Comment 5: Page 3-17. It is highly unlikely that an Arsenic hit of nearly 50ppm at CAA01-SO04 from Table 3-1 is attributed to background. This is almost an order of magnitude above our background number. Please carry Arsenic through as a COPC.

Section 4
EPA RPM Comment 7: AOC 2 should be considered a solid waste landfill which would be subject to Virginia State regulations.

EPA RPM Comment 8: Page 4-3. A number of drums were found in the area of AOC2TT05-AOC2TT10, AOC2TT13 and AOC2TT14, yet no samples were collected in this area according to Figures 4-4, 4-5, and 4-6. Please collect samples from this area.

EPA RPM Comment 9: Page 4-5. "Not considered a CERCLA Source". This is still improper disposal which would be subject to Virginia State regulations.

EPA RPM Comment 10: Page 4-6. The PCB discussion states that PCBs were detected above residential screening at the duplicate of A2-TP01, but then goes on to say that Aroclor 1260 was not detected in the soil at A2-TP01. Presumably the original A2-TP01 and its' duplicate were taken from the same location and not separate samples correct? I do realize it is possible for an original sample and a dup. to have different detections, but the paragraph implies one sample was within the waste and one was from the native soil below the waste. Also, it appears an interim removal action will be prepared to remove the waste from Area 2. This should be used as the rationale as to why the Aroclor 1260 detection is not of concern. Confirmation samples following the removal should include PCB analysis due to a high degree of uncertainty associated with the contaminants distribution.

EPA RPM Comment 12: According to Figure 4-3 there is a "Significant Geophysical Anomaly" in the North West corner of the site that was not investigated.

EPA RPM Comment 13: Areas 1b and Area 3 are dumps that don't appear to have to have been sampled according to the figures. Please provide rationale in a RTC as to why this would be acceptable. Presumably the response would be the types of materials disposed would not be expected to create contamination, however, it is highly that any disposing that occurred was an orderly disposal of specific material. Environmental sampling should be conducted to ensure there was no disposal of hazardous materials.

Section 5

EPA RPM Comment 14: Page 5-4. 1918 Drum Storage Area. EPA suggests samples are collected and analyzed for VOCs, PCBs and Pesticides.

EPA RPM Comment 15: Page 5-10. Bis(2-ethylhexyl)phthalate. If the contaminant was likely attributed lab contamination, was it detected in the blanks?

EPA RPM Comment 16: Page 5-12 Ammonia Settling Pits. Check with Rob to make sure the correct chemicals were analyzed for.

EPA RPM Comment 17: Page 5-13. Ammonia Settling Pit. Groundwater Discussion. Averaging groundwater samples is not acceptable. See RPM General Comment.

EPA RPM Comment 18: Page 5-17. Mean HQ for Aluminum and Lead. See RPM General Comment

EPA RPM Comment 19: Page 5-17. DAF applied directly to groundwater sample. See EPA RPM General Comment.

EPA RPM Comment 20: Page 5-18. Mean HQ for HMX and Mercury. See EPA RPM General Comment.

EPA RPM Comment 21: Page 5-18. Groundwater discussion. Please see EPA RPM General Comment 1.

EPA RPM Comment 22: Page 5-19. Surface Soil. Bullets 1,2, and 3. See EPA RPM General Comments.

Section 6

EPA RPM Comment 23: Penniman Lake Surface Water Discussion. The argument that the screening level of 4ppb for barium is conservative should be overcome by the fact that we exceeded it by nearly 5x as well as it being detected at multiple locations. Please refine Barium as a COPC in surface water.

EPA RPM Comment 24: Page 6-5. Lead 984ppm. See EPA RPM General Comments

EPA RPM Comment 25: Page 6-6. Groundwater. Lead. See RPM General Comments.

EPA RPM Comment 26: Page 6-7. Subsurface Soil. See RPM General Comments.

EPA RPM Comment 27: Page 6-8. Groundwater. See EPA RPM General Comment.

EPA RPM Comment 28. Page 6-8. Second to last word. Typo.

EPA RPM Comment 29: Former Drum Pile. Was GPR preformed on this AOC (I may have missed it)?

EPA RPM Comment 30: Figure 6-4. From Figure 6-4 it does not appear that the actual nature of the pit has been characterized (although extent appears to have been defined). Since the path forward for the Site is a removal action, the only comment would be to analyze for a full suite of analytes during confirmation samples.

Section 7

EPA RPM Comment 31: Page 7-7. Mean Zinc. See RPM General Comments.

EPA RPM Comment 32: Page 7-8. Groundwater. See RPM General Comments.

Appendix A

EPA RPM Comment 33: Page A-5. AOC 1 South. Lead 698ppm. See EPA RPM General Comment.

EPA RPM Comment 34: Page A-7. Iron discussion. This doesn't make sense. Although Iron is an essential human nutrient, there is some science that went in to the development HQ and screening values developed. If a chemical is exceeding the screening values we can't say "it is likely that exposure to iron at the concentrations present on the site would not result in any adverse health effects". That is essentially questioning the science that went in to the development of the risk numbers. Please revise.

EPA RPM Comment 35: Page A-7. Doesn't the RAGs Guidance caution against screening something out (Thallium) because it doesn't have a screening criteria? I believe it should be carried through.

EPA RPM Comment 36: Page A-7. Aroclor-1260. Should be cumulative risk. See EPA RPM General Comments.

EPA RPM Comment 37: Page A-10. Ammonia Settling Pit Area. Lead. See RPM General Comments.

EPA Tox Comment 1: In Section 2.4 of the report, the text should confirm that surface and subsurface soil samples were collected from original soil (not fill material), where contamination, if any, would likely be found.

EPA Tox Comment 2: According to Table 2-1, in terms of organics, only TCL SVOCs were considered at AOC 6. Why wasn't the full TCL suite considered? This could represent a data gap. Fortunately, most of the subareas in AOC 6 will move forward for additional investigation; however, the 1918 Drum Storage Area dropped out. Unless strong justification can be provided for this omission, consideration should be given to collecting additional samples from the 1918 Drum Storage Area to rule out the presence of VOCs, PCBs and pesticides in soil.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

3 – Navy's Response to USEPA's Comments on the Draft SI Report

Response To Comments

Draft Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA

October 4, 2011

Comments received by email on August 15, 2011 from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3.

Comment provided via email: *I have a number of issues with this. Although the general HH Risk screening process provided in appendix A is generally an acceptable and common approach, the document doesn't necessarily follow the process. Many of the chemicals are screened out based on inappropriate screening techniques (inconsistent with EPA Guidance) or judgment calls and not based on scientific evidence. While judgement call may be an acceptable way of proceeding as a site progresses through the CERCLA process, the high level of uncertainty (limited sample coverage) associated with a PA/SI makes these decisions premature.*

Response: The human health and ecological risk screenings conducted were carried out under the current USEPA and/or Navy ERA guidance. Based on a review of the available SI analytical data, the proposed paths forward for the various AOCs followed a logical scientific decision analysis and were not based on opinion. While there will always be a certain amount of uncertainty associated with any PA/SI, the Navy believes that the proposed recommendations were made based on sound scientific evidence; for those AOCs where uncertainty exists, further investigation has been proposed.

EPA RPM General Comment 1: *There are a multiple instances in this document that are inconsistent with EPA Guidance and some revisions will need to be made or an explanation should be provided as to why they would be appropriate. Examples would be: averaging groundwater samples, applying dilution attenuation factors directly to groundwater samples (typically DAFs are used for and applied to soil migration to groundwater), screening risks from individual chemical against the 5x10-5 cancer and 0.5 HQ screening level (should be cumulative risk for the site not on a per chemical basis), and taking the mean HQ of soil samples and screening them out.*

Further, much of the above is not consistent with the Human Health Screening Methodology (A.2) in Appendix A of this document.

Response: The ecological risk screening methodology was outlined in Appendix B, Section B.2, on which there were no comments. Three of the four examples provided in the comment appear to apply to the ecological screenings. The rationale for using mean groundwater concentrations

and dilution factors (not DAFs) in the refined step of the ecological groundwater screenings, and mean soil concentrations in the refined step of the ecological soil screenings, are provided in Appendix B, Section B.2. None of the methods used are known to be precluded in EPA or Navy ERA guidance.

In terms of the HHRA, the only time the average groundwater (or soil) concentration is used is when considering lead. This is because the method used to evaluate lead (the IEUBK model) uses the average concentration of lead as the input value for the model. The identification of the potential for carcinogenic risk or hazard is based on the cumulative risk and cumulative hazard (per target organ). However, to understand which constituents contribute the most to these cumulative risks or hazards, we do point out if individual constituents exceed these levels or not, but it is not used to identify if the site may pose an unacceptable risk or hazard or not. These discussions are presented to supply further information about the site and potential contamination detected at the site.

EPA RPM General Comment 2: *A number of chemicals which did not have screening values were screened out by being compared to screening values of other similar explosives. Please provide the actual compound they were compared to, the actual screening value used, and how that number was developed. Please revise each instance of this in the document for transparency purposes (note that not all instances of this are noted in the comments).*

Response: For the ecological screenings, there were five instances (all in soil) where this occurred. In these cases, the soil concentrations for the explosives without a screening value were compared with the range of screening values for all other explosives with such values. These values, which are provided in Table B-1, ranged from 1,000 to 80,000 µg/kg. This explanation will be added to the bullets for the five relevant occurrences.

EPA RPM General Comment 3: *Please include risk screening tables similar to the Example Risk Screening tables (attached) at the end of each Section for transparency purposes. These tables should include all COPCs that passed through the screening process.*

Response: Summary tables listing the COPCs that passed through the screening process at each AOC are included as the final table in each AOC section of the report. Specifically, these COPCs are included in the Decision Summary tables, which include Tables 3-7, 4-4, 5-12, 6-4, and 7-4.

The Decision Summary tables were prepared to consolidate the results of the human health and ecological risk screenings steps. Detailed tables listing the risk screening calculations are included in Appendices A and B.

Since all of the COPCs that passed through the screening process are included in the general Decision Summary tables, as well as in detail within Appendices A and B, the Navy believes that no revision of the risk screening tables is necessary.

Section 2
EPA RPM Comment 1: *Page 2-1. Although the investigation methodology etc… from the previous investigation are not included in the report, I assuming all sample data are. Correct?*

Response: The available historical sample data from previous investigations at AOC 1, AOC 2, AOC 6, and AOC 8 are included in Appendix G, Historical Analytical Data. For clarification, the text on page 3-3 will be revised to state:

"With the exception of arsenic (7.4 mg/kg) in sediment, only low, estimated levels of phthalates, ethylbenzene and xylenes near reporting limits were detected in historical surface water and sediment samples (**Tables G-3 and G-4, Appendix G**)."

Section 3
EPA RPM Comment 2: *Page 3-13. This is an incorrect application of dilution attenuation factors. DAF are utilized the project what we may see in groundwater from a soil sample value. Applying a DAF directly to a groundwater sample makes no sense and is not consistent with EPA guidance. Please revise.*

Response: These are dilution factors, <u>not</u> DAFs, as described in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 3: *Page 3-15. Groundwater. It is unclear as to why we would average groundwater samples. Wells should be evaluated on a per well basis.*

Response: The rationale is provided in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 4: *Page 3-17. Eco Risk Evaluation. Eco Risks should be calculated for these sites. Although the size of the sites may be small, they are essentially all habitat (forested cover etc… not a parking lot).*

Response: Potential ecological risks were evaluated for these sites, as provided in Section 3.2.4 and Appendix B. The page referenced in the comment provides a summary of the results. The small size of the sites was included as a factor explaining why the risks are likely to be low (i.e., they would be limited, spatially). Consideration of such factors is consistent with the ecological risk screening methodology provided in Appendix B, Section B.2.

EPA RPM Comment 5: *Page 3-17. It is highly unlikely that an Arsenic hit of nearly 50ppm at CAA01-SO04 from Table 3-1 is attributed to background. This is almost an order of magnitude above our background number. Please carry Arsenic through as a COPC.*

Response: While the maximum arsenic concentration of 47.5 L mg/kg in surface soil at CAA01-SO04 exceeded the respective base background UTL for arsenic (6.36 mg/kg) by almost an order of magnitude, the maximum arsenic concentration in this sample did not exceed the maximum base background for arsenic (63.9 mg/kg). As such, the maximum concentration detected in surface soil is likely attributable to natural background conditions, as documented in

the first bullet on page 3-5. Based on this information, arsenic was not carried through as a COPC during the risk screening process.

(NOTE: Comment 6 was not provided by the USEPA. Comments proceeded from Comment 5 to Comment 7)

Section 4
EPA RPM Comment 7: *AOC 2 should be considered a solid waste landfill which would be subject to Virginia State regulations.*

Response: AOC 2 is excluded from regulation under 9 VAC 20-81 by 9 VAC 20-81-35(E) and 9 VAC 20-81 45(B)(2)(f) since it is being remediated under CERCLA and ceased disposal operations prior to regulation.

EPA RPM Comment 8: *Page 4-3. A number of drums were found in the area of AOC2TT05-AOC2TT10, AOC2TT13 and AOC2TT14, yet no samples were collected in this area according to Figures 4-4, 4-5, and 4-6. Please collect samples from this area.*

Response: As documented in Attachment B of the *Final Trenching Letter Report, Site 1, Site 4, and AOC 2* Baker, 2002), empty 55-gallon drums were observed only in test trenches AOC2TT13 and AOC2TT14; no drums were observed in test trenches AOC2TT05 through AOC2TT10. No samples were collected during the most recent AOC 2 field investigation in 2001.

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 (Figures 4-4 and 4-5). Prior to finalization of the Final SI Work Plan, during a phone conversation with CH2M HILL, the Navy RPM, and USEPA on September 12, 2008, the USEPA agreed that no additional sampling at AOC 2 was required during the SI as long as the respirator cartridges were removed. The Navy agreed, and as documented in the Response to Comments on the Draft Final Work Plan submitted to the WPNSTA Yorktown/CAX Partnering Team, "…the Navy plans on conducting a removal action to address the existing respirator cartridges, …".

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 that contains the respirator cartridges (Figures 4-4 and 4-5) that will be removed during an EE/CA that will be performed at AOC 2. Since confirmation sampling is planned as part of the EE/CA, the Navy believes sampling of the area where the drums were observed is not necessary.

EPA RPM Comment 9: *Page 4-5. "Not considered a CERCLA Source". This is still improper disposal which would be subject to Virginia State regulations.*

Response: The debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes and are not CERCLA-related wastes. Under 9VAC20-81-45(B)(2)(f), the open dump criteria does not apply to sites that are undergoing remediation per the requirements of CERCLA or the RCRA Corrective Action Program and are doing so with the department's and/or the Environmental Protection Agency's oversight. At this time, the Navy believes that the

CERCLA action being taken at AOC 2 constitutes sufficient remedial action for the non-CERCLA wastes that were disposed of at the site.

EPA RPM Comment 10: *Page 4-6. The PCB discussion states that PCBs were detected above residential screening at the duplicate of A2-TP01, but then goes on to say that Aroclor 1260 was not detected in the soil at A2-TP01. Presumably the original A2-TP01 and its' duplicate were taken from the same location and not separate samples correct? I do realize it is possible for an original sample and a dup. to have different detections, but the paragraph implies one sample was within the waste and one was from the native soil below the waste. Also, it appears an interim removal action will be prepared to remove the waste from Area 2. This should be used as the rationale as to why the Aroclor 1260 detection is not of concern. Confirmation samples following the removal should include PCB analysis due to a high degree of uncertainty associated with the contaminants distribution.*

Response: The report text will be revised to clarify the PCB detection as follows:

"One PCB (Aroclor-1260) was detected in only one subsurface soil sample (310 µg/kg in the duplicate A2-TP01**F at Test Pit TP01**), slightly above the residential RSL (220 µg/kg) (Figure 4-7). However, the primary sample from this location was below screening criteria. **Both of** these subsurface soil samples**, A2-TP01F and its duplicate,** were collected within the debris zone at approximately 3.5 feet bgs. **However,** Aroclor-1260 was not detected in the native soil sample (A2-TP01**N**) collected from the bottom of Test Pit TP01 at 5 feet bgs. Therefore, Aroclor-1260 is likely a localized occurrence and not migrating from the debris material. PCBs tend to bind to soil and are not readily mobile."

While the interim removal action at AOC 2 precludes the Aroclor 1260 detection from being a concern, the interim removal action for AOC 2 is not introduced in the report until p. 4-12. Since mention of this removal action on p. 4-6 would disrupt the logical progression of information being presented in Section 4, this rationale has not been included on p. 4-6.

(NOTE: Comment 11 was not provided by the USEPA. Comments proceeded from Comment 10 to Comment 12)

EPA RPM Comment 12: *According to Figure 4-3 there is a "Significant Geophysical Anomaly" in the North West corner of the site that was not investigated.*

Response: Noted. During the 1998 geophysical investigation, a significant metallic response was identified in the EM-61 data in the northwest corner of the AOC 2 geophysical investigation area, as shown in Figure 4-3 of the SI report. However, as documented in Appendix A of the Final Field Investigation Report, Site 1 and AOC 2 (Baker, 1999), this anomaly was not identified as an anomaly that could not be explained by a surface object. Furthermore, the EM-31 quadrature data for AOC 2, also collected during the 1998 geophysical investigation, complemented most of the EM-61 and in-phase responses, but with less resolution. Based on review of the EM-31 data, "increases in terrain conductivity can be seen along the entire western edge of the grid. Although there are no metallic anomalies corresponding to this feature it was suggested by Baker personnel on site that this is the possible location of an abandoned railroad.

The changes in terrain conductivity may be due to a nonmetallic but relatively conductive material that was used for the railroad bed" (Baker, 1999). While the Final Field Investigation Report does not state specifically why this northwest area was not investigated, it is assumed that the northwest anomaly was likely associated with the abandoned railroad bed.

EPA RPM Comment 13: *Areas 1b and Area 3 are dumps that don't appear to have to have been sampled according to the figures. Please provide rationale in a RTC as to why this would be acceptable. Presumably the response would be the types of materials disposed would not be expected to create contamination, however, it is highly that any disposing that occurred was an orderly disposal of specific material. Environmental sampling should be conducted to ensure there was no disposal of hazardous materials.*

Response: Based on the AOC 2 test pit and test trenching logs, the debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes, which are not CERCLA-related wastes. No debris or waste was observed during the trenching activities to propose that hazardous materials were disposed at AOC 2. As such, the Navy does not believe that environmental sampling is necessary.

Section 5

EPA RPM Comment 14: *Page 5-4. 1918 Drum Storage Area. EPA suggests samples are collected and analyzed for VOCs, PCBs and Pesticides.*

Response: The constituents sampled for and analyzed during the CAX AOC SI, as listed in the Final SI Work Plan agreed to by the WPNSTA Yorktown/CAX Partnering Team, were based on the review of constituents detected during Weston's 1999 Site Inspection. As documented in the WPNSTA Yorktown/CAX Partnering Team Final 15 November 2007 Meeting Minutes, Rob Thomson (USEPA) requested that phthalates be added to the list of analytes to be sampled at AOC 6 during the SI. As such, SVOCs were added to the Final SI Work Plan. Based on the re-review of the 1999 and current AOC 6 SI analytical data, the Navy believes that no additional sampling and analysis for VOCs, PCBs, and Pesticides at the 1918 Drum Storage Area is necessary.

EPA RPM Comment 15: *Page 5-10. Bis(2-ethylhexyl)phthalate. If the contaminant was likely attributed lab contamination, was it detected in the blanks?*

Response: The SVOC Bis(2-ethylhexyl)phthalate was not detected in any of the blanks and was inadvertently identified as exceeding the ecological screening value in the pre-Draft report, which listed the Screening Level Concentration (SCL) screening values as the eco screening criteria for sediment. The organic chemicals in sediment were actually screened against both SCL screening values and Equilibrium Partitioning (EqP) screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Appendix B, Table B-3. While the pre-draft tables included the SLC as the ecological screening value, the EqP was the actual screening value used for bis(2-Ethylhexyl)phthalate detected in the AOC 6 sediment samples, as listed in Table 5-11.

Specifically, as documented in Appendix B, pp. B-12 through B-13, Bis(2-ethylhexyl)phthalate exceeded the SLC screening value, but not the EqP screening value, based upon the maximum detected concentration. However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC.

The text on p. 5-10, carried over from the pre-draft, inadvertently includes the SCL instead of the EqP. Based on this information, Bis(2-ethylhexyl)phthalate was not an initial COPC. Only one SVOC, 2,6-Dinitrotoluene, initially exceeded the ecological screening criteria. The text will be revised to state the following:

"SVOCs and Explosives

One SVOC, **2,6-Dinitrotoluene**, exceeded the **Equilibrium Partitioning (EqP) value of 187** µg/kg in one **sub**surface sediment sample (**SD02**, near the **Ammonia Settling Pits**) at a concentration of **260 µg/kg.** However**, since the mean HQ for 2,6-Dinitrotoluene was less than one, this constituent was not identified as a refined COPC during the ecological risk screening**. No other SVOCs or explosives exceeded their respective screening criterion in surface and --subsurface sediment samples."

EPA RPM Comment 16: *Page 5-12 Ammonia Settling Pits. Check with Rob to make sure the correct chemicals were analyzed for.*

Response: No response necessary. As instructed by the USEPA via email on August 23, 2011, this comment was a note by the USEPA reviewer and should be disregarded.

EPA RPM Comment 17: *Page 5-13. Ammonia Settling Pit. Groundwater Discussion. Averaging groundwater samples is not acceptable. See RPM General Comment.*

Response: The methodology used to screen and evaluate lead in the HHRS was described in Appendix A, page A-3, as follows "Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC for the AOC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009a). If the lead concentrations are greater than the action level, it is retained as a COPC for the AOC." The use of the average lead concentration is consistent with EPA guidance, as the average concentration is the concentration that is used when lead is evaluated using the IEUBK model.

EPA RPM Comment 18: *Page 5-17. Mean HQ for Aluminum and Lead. See RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 19: *Page 5-17. DAF applied directly to groundwater sample. See EPA RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 20: *Page 5-18. Mean HQ for HMX and Mercury. See EPA RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 21: *Page 5-18. Groundwater discussion. Please see EPA RPM General Comment 1.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 22: *Page 5-19. Surface Soil. Bullets 1,2, and 3. See EPA RPM General Comments.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 23: *Penniman Lake Surface Water Discussion. The argument that the screening level of 4ppb for barium is conservative should be overcome by the fact that we exceeded it by nearly 5x as well as it being detected at multiple locations. Please refine Barium as a COPC in surface water.*

Response: The surface water screening value for barium (4 µg/L) is conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural water bodies but very toxic, while the surface water sample was measured for total barium. For comparison, the USEPA Region 5 freshwater screening value for total barium is 200 µ/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 µ/L). This explanation will be added to the text of the SI and barium will not be identified as a COPC.

Section 6
EPA RPM Comment 24: *Page 6-5. Lead 984ppm. See EPA RPM General Comments.*

Response: Please see the response to Comment 17.

EPA RPM Comment 25: *Page 6-6. Groundwater. Lead. See RPM General Comments.*

Response: Please see the response to Comment 17.

EPA RPM Comment 26: *Page 6-7. Subsurface Soil. See RPM General Comments.*

Response: Please see the response to General Comment 2.

EPA RPM Comment 27: *Page 6-8. Groundwater. See EPA RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 28*: Page 6-8. Second to last word. Typo.*

Response: Corrected. The second to last word in the final sentence on p. 6-8, "work", has been revised to "word".

EPA RPM Comment 29: *Former Drum Pile. Was GPR preformed on this AOC (I may have missed it)?*

Response: No, GPR has not been conducted in the vicinity of the Former Drum Pile.

EPA RPM Comment 30: *Figure 6-4. From Figure 6-4 it does not appear that the actual nature of the pit has been characterized (although extent appears to have been defined). Since the path forward for the Site is a removal action, the only comment would be to analyze for a full suite of analytes during confirmation samples.*

Response: An expanded SI is recommended for AOC 7 (Drum Disposal and Can Pit Area) in order to verify the groundwater flow directions and to verify and characterize the extent of inorganic contamination. As indicated by the current SI analytical data, no VOCs, SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in soil, and no SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in groundwater. Only one VOC exceeded screening criteria in groundwater.

Prior to preparing the expanded SI work plan, the current SI analytical data will be reviewed and a focused list of analytes will be recommended based on the recent detections.

Section 7
EPA RPM Comment 31: *Page 7-7. Mean Zinc. See RPM General Comments.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 32: *Page 7-8. Groundwater. See RPM General Comments.*

Response: Please see the response to General Comment 1.

Appendix A
EPA RPM Comment 33: *Page A-5. AOC 1 South. Lead 698ppm. See EPA RPM General Comment.*

Response: Please see the response to Comment 17.

EPA RPM Comment 34: *Page A-7. Iron discussion. This doesn't make sense. Although Iron is an essential human nutrient, there is some science that went in to the development HQ and screening values developed. If a chemical is exceeding the screening values we can't say "it is likely that exposure to iron at the concentrations present on the site would not result in any adverse health effects". That is essentially questioning the science that went in to the development of the risk numbers. Please revise.*

Response: We will revise the paragraph discussing iron as follows to indicate that the maximum detected iron concentration would not result in an intake above the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. The following text will be added to Page A-7:

"Iron, the only contributor to the potential noncarcinogenic hazard is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample B03. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 8.8 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 18 mg/day iron (44,000 mg/kg x ingestion rate of 400 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children."

EPA RPM Comment 35: *Page A-7. Doesn't the RAGs Guidance caution against screening something out (Thallium) because it doesn't have a screening criteria? I believe it should be carried through.*

Response: Thallium was not carried through the screening tables because it was not possible to estimate any contribution to the cumulative hazard/risk associated with thallium. Between the draft and draft final document, the latest RSL update (June 2011) became available, and there are now RSLs for thallium. The thallium detections for all media for all AOCs were compared (not risk screened) to the new thallium RSLs:

- Res. Soil RSL: listed as .78 mg/kg, adjusted value .078 mg/kg
- Ind. Soil RSL: listed as 10 mg/kg, adjusted value 1 mg/kg
- GW Tapwater RSL: listed as .37 µg/L, adjusted value .037 µg/L
- SW RSL: listed as 3.7 µg/L, adjusted value 0.37 µg/L

The thallium concentrations exceeded the respective RSL for these AOCs and media and could potentially be a COPC:

AOC 2:

- Thallium in **SB** - sample CAA02-A2-TP02-N-1999 (0.84 L mg/kg)
- Total thallium in **GW** - samples CAA02-A2DPW01-1098 (1.2 L µg/L) and CAA02-A2DPW02-1098 (2 J µg/L)

AOC 6 – 1918 Drum Storage Area:

- Total thallium in **SB** - sample CAA06-SB16-1108 (0.08 J mg/kg)
- Total thallium in **GW** - samples CAA06-DW09-1108 (2.1 J UG/L), CAA06-DW10P-1108 (1.7 J µg/L), CAA06-DW11-1108 (2.2 J µg/L)
- Dissolved thallium in **GW** - sample CAA06-DW09-1108 (2 J µg/L)
-

AOC 6 TNT Areas:

- Thallium in **SS** – sample CAA06-SS03-1008 (0.18 J mg/kg)
- Thallium in **SW** - sample CAA06-SW01-1008 (1.7 J µg/L)

AOC 8:

- Thallium in **SS** - sample CAA08-SS01-1008 (0.08 J mg/kg)
- Dissolved thallium in **GW** - sample CAA08-DW04-1008 (1.9 J µg/L)

For AOC 2, thallium was not detected in the dissolved metals fraction in groundwater, thus the total results are likely attributable to suspended solids. The subsurface soil location where thallium exceeded the RSL is within the removal area that will be in the interim removal action area. Therefore, no change to the recommendations for AOC 2 is necessary.

For the AOC 6 – 1918 Drum Storage Area, since the SI recommendation was no further action, the human health risk screening for this area was re-run using the June 2011 RSLs (for all constituents, including thallium). Results of the updated risk screening continue to indicate that exposure to surface and subsurface soil within the 1918 Drum Storage Area would not result in any unacceptable risks. While exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals, this potential risks is based on total inorganics detected in the groundwater; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum was the only inorganic detected in the dissolved fraction and is likely attributable to background; therefore, no unacceptable human health risk above background is expected for groundwater. The no further action recommendation is still appropriate and no change to the SI report is necessary.

For the AOC 6 – TNT Areas surface soil, an RI is the recommended path forward for the AOC; thus, thallium will be evaluated as part of the HH risk assessment. Regarding the surface water sample, the total thallium concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 µg/L), but does not exceed the unadjusted screening level (tap water

RSL times ten, 3.7 µg/L). In addition, thallium was not detected in the dissolved fraction. No change to the SI report is necessary.

For AOC 8, the surface soil sample thallium concentration listed above was within the range of the residential RSL (considering significant figures). Regarding the AOC 8 groundwater, an RI is the recommended path forward; thus, thallium will be evaluated as part of the HH risk assessment and no change to the SI report is necessary.

The text in the individual AOC sections and Appendix A (the HH risk screen) will be revised, as appropriate, to reflect that there are now RSLs for thallium and the comparison to them and conclusions presented above. For the AOC 6 Drum Storage Area, the text, tables, and figures will be updated to reflect the revised HH risk screen.

EPA RPM Comment 36: *Page A-7. Aroclor-1260. Should be cumulative risk. See EPA RPM General Comments.*

Response: Agree. However, the point of this paragraph is to show that the risk is primarily associated with chromium, based on the assumption that all of the chromium is in the hexavalent form, and to identify the relative contribution from each of the carcinogenic COPCs.

EPA RPM Comment 37: *Page A-10. Ammonia Settling Pit Area. Lead. See RPM General Comments.*

Response: Please see the response to Comment 17.

EPA Tox Comment 1: *In Section 2.4 of the report, the text should confirm that surface and subsurface soil samples were collected from original soil (not fill material), where contamination, if any, would likely be found.*

Response: For clarification, the report text in Section 2.4 will be revised as follows:

"Surface soil samples were collected from **native soil** 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, **non-native** deep subsurface soil samples were collected at AOCs 7 and 8 from the bottom of test pits considered to be most impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris."

EPA Tox Comment 2: *According to Table 2-1, in terms of organics, only TCL SVOCs were considered at AOC 6. Why wasn't the full TCL suite considered? This could represent a data gap. Fortunately, most of the subareas in AOC 6 will move forward for additional investigation; however, the 1918 Drum Storage Area dropped out. Unless strong justification can be provided for this omission, consideration should be given to collecting additional samples from the 1918 Drum Storage Area to rule out the presence of VOCs, PCBs and pesticides in soil.*

Response: Please see the response to Comment 14.

4 – USEPA's Additional Comments on the Draft SI Report

Response To Comments

Draft Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA

October 4, 2011

Comments received by email on August 15, 2011 from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3.

Comment provided via email: *I have a number of issues with this. Although the general HH Risk screening process provided in appendix A is generally an acceptable and common approach, the document doesn't necessarily follow the process. Many of the chemicals are screened out based on inappropriate screening techniques (inconsistent with EPA Guidance) or judgment calls and not based on scientific evidence. While judgement call may be an acceptable way of proceeding as a site progresses through the CERCLA process, the high level of uncertainty (limited sample coverage) associated with a PA/SI makes these decisions premature.*

Response: The human health and ecological risk screenings conducted were carried out under the current USEPA and/or Navy ERA guidance. Based on a review of the available SI analytical data, the proposed paths forward for the various AOCs followed a logical scientific decision analysis and were not based on opinion. While there will always be a certain amount of uncertainty associated with any PA/SI, the Navy believes that the proposed recommendations were made based on sound scientific evidence; for those AOCs where uncertainty exists, further investigation has been proposed.

EPA Email Response: Noted

EPA RPM General Comment 1: *There are a multiple instances in this document that are inconsistent with EPA Guidance and some revisions will need to be made or an explanation should be provided as to why they would be appropriate. Examples would be: averaging groundwater samples, applying dilution attenuation factors directly to groundwater samples (typically DAFs are used for and applied to soil migration to groundwater), screening risks from individual chemical against the 5x10-5 cancer and 0.5 HQ screening level (should be cumulative risk for the site not on a per chemical basis), and taking the mean HQ of soil samples and screening them out.*

Further, much of the above is not consistent with the Human Health Screening Methodology (A.2) in Appendix A of this document.

Response: The ecological risk screening methodology was outlined in Appendix B, Section B.2, on which there were no comments. Three of the four examples provided in the comment appear

to apply to the ecological screenings. The rationale for using mean groundwater concentrations and dilution factors (not DAFs) in the refined step of the ecological groundwater screenings, and mean soil concentrations in the refined step of the ecological soil screenings, are provided in Appendix B, Section B.2. None of the methods used are known to be precluded in EPA or Navy ERA guidance.

In terms of the HHRA, the only time the average groundwater (or soil) concentration is used is when considering lead. This is because the method used to evaluate lead (the IEUBK model) uses the average concentration of lead as the input value for the model. The identification of the potential for carcinogenic risk or hazard is based on the cumulative risk and cumulative hazard (per target organ). However, to understand which constituents contribute the most to these cumulative risks or hazards, we do point out if individual constituents exceed these levels or not, but it is not used to identify if the site may pose an unacceptable risk or hazard or not. These discussions are presented to supply further information about the site and potential contamination detected at the site.

EPA General Comment 1 Response: EPA's initial belief was that the sole purpose of the report was to determine whether further action would be needed at these AOCs. EPA BTAG will now be reviewing the document and appendices due to the potential ramifications of the report (eliminating COPC etc…).

EPA RPM General Comment 2: *A number of chemicals which did not have screening values were screened out by being compared to screening values of other similar explosives. Please provide the actual compound they were compared to, the actual screening value used, and how that number was developed. Please revise each instance of this in the document for transparency purposes (note that not all instances of this are noted in the comments).*

Response: For the ecological screenings, there were five instances (all in soil) where this occurred. In these cases, the soil concentrations for the explosives without a screening value were compared with the range of screening values for all other explosives with such values. These values, which are provided in Table B-1, ranged from 1,000 to 80,000 µg/kg. This explanation will be added to the bullets for the five relevant occurrences.

EPA General Comment 2 Response: See EPA General Comment 1 Response.

EPA RPM General Comment 3: *Please include risk screening tables similar to the Example Risk Screening tables (attached) at the end of each Section for transparency purposes. These tables should include all COPCs that passed through the screening process.*

Response: Summary tables listing the COPCs that passed through the screening process at each AOC are included as the final table in each AOC section of the report. Specifically, these COPCs are included in the Decision Summary tables, which include Tables 3-7, 4-4, 5-12, 6-4, and 7-4.

The Decision Summary tables were prepared to consolidate the results of the human health and ecological risk screenings steps. Detailed tables listing the risk screening calculations are included in Appendices A and B.

Since all of the COPCs that passed through the screening process are included in the general Decision Summary tables, as well as in detail within Appendices A and B, the Navy believes that no revision of the risk screening tables is necessary.

EPA RPM General Comment 3 Response: ok

Section 2
EPA RPM Comment 1: *Page 2-1. Although the investigation methodology etc… from the previous investigation are not included in the report, I assuming all sample data are. Correct?*

Response: The available historical sample data from previous investigations at AOC 1, AOC 2, AOC 6, and AOC 8 are included in Appendix G, Historical Analytical Data. For clarification, the text on page 3-3 will be revised to state:

"With the exception of arsenic (7.4 mg/kg) in sediment, only low, estimated levels of phthalates, ethylbenzene and xylenes near reporting limits were detected in historical surface water and sediment samples (**Tables G-3 and G-4, Appendix G**)."

EPA RPM Comment 1 Response: Please indicate whether the data was included in the risk evaluation.

Section 3
EPA RPM Comment 2: *Page 3-13. This is an incorrect application of dilution attenuation factors. DAF are utilized the project what we may see in groundwater from a soil sample value. Applying a DAF directly to a groundwater sample makes no sense and is not consistent with EPA guidance. Please revise.*

Response: These are dilution factors, <u>not</u> DAFs, as described in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 2 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 3: *Page 3-15. Groundwater. It is unclear as to why we would average groundwater samples. Wells should be evaluated on a per well basis.*

Response: The rationale is provided in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 3 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 4: *Page 3-17. Eco Risk Evaluation. Eco Risks should be calculated for these sites. Although the size of the sites may be small, they are essentially all habitat (forested cover etc… not a parking lot).*

Response: Potential ecological risks were evaluated for these sites, as provided in Section 3.2.4 and Appendix B. The page referenced in the comment provides a summary of the results. The small size of the sites was included as a factor explaining why the risks are likely to be low (i.e., they would be limited, spatially). Consideration of such factors is consistent with the ecological risk screening methodology provided in Appendix B, Section B.2.

EPA RPM Comment 4 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 5: *Page 3-17. It is highly unlikely that an Arsenic hit of nearly 50ppm at CAA01-SO04 from Table 3-1 is attributed to background. This is almost an order of magnitude above our background number. Please carry Arsenic through as a COPC.*

Response: While the maximum arsenic concentration of 47.5 L mg/kg in surface soil at CAA01-SO04 exceeded the respective base background UTL for arsenic (6.36 mg/kg) by almost an order of magnitude, the maximum arsenic concentration in this sample did not exceed the maximum base background for arsenic (63.9 mg/kg). As such, the maximum concentration detected in surface soil is likely attributable to natural background conditions, as documented in the first bullet on page 3-5. Based on this information, arsenic was not carried through as a COPC during the risk screening process.

EPA RPM Comment 5 Response: EPA does not agree with eliminating Arsenic as a COPC as part of a SI risk screening process. Please carry through arsenic as a COPC or elevate the issue to tier 2.

(NOTE: Comment 6 was not provided by the USEPA. Comments proceeded from Comment 5 to Comment 7)

Section 4
EPA RPM Comment 7: *AOC 2 should be considered a solid waste landfill which would be subject to Virginia State regulations.*

Response: AOC 2 is excluded from regulation under 9 VAC 20-81 by 9 VAC 20-81-35(E) and 9 VAC 20-81 45(B)(2)(f) since it is being remediated under CERCLA and ceased disposal operations prior to regulation.

EPA RPM Comment 7 Response: Noted.

EPA RPM Comment 8: *Page 4-3. A number of drums were found in the area of AOC2TT05-AOC2TT10, AOC2TT13 and AOC2TT14, yet no samples were collected in this area according to Figures 4-4, 4-5, and 4-6. Please collect samples from this area.*

Response: As documented in Attachment B of the *Final Trenching Letter Report, Site 1, Site 4, and AOC 2* Baker, 2002), empty 55-gallon drums were observed only in test trenches AOC2TT13 and AOC2TT14; no drums were observed in test trenches AOC2TT05 through AOC2TT10. No samples were collected during the most recent AOC 2 field investigation in 2001.

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 (Figures 4-4 and 4-5). Prior to finalization of the Final SI Work Plan, during a phone conversation with CH2M HILL, the Navy RPM, and USEPA on September 12, 2008, the USEPA agreed that no additional sampling at AOC 2 was required during the SI as long as the respirator cartridges were removed. The Navy agreed, and as documented in the Response to Comments on the Draft Final Work Plan submitted to the WPNSTA Yorktown/CAX Partnering Team, "…the Navy plans on conducting a removal action to address the existing respirator cartridges, …".

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 that contains the respirator cartridges (Figures 4-4 and 4-5) that will be removed during an EE/CA that will be performed at AOC 2. Since confirmation sampling is planned as part of the EE/CA, the Navy believes sampling of the area where the drums were observed is not necessary.

EPA RPM Comment 8 Response: The text currently states, "In eight of these trenches (AOC2TT05 through AOC2TT10, AOC2TT13, and AOCTT14) dextrose bottles, some clothing, metal debris, and empty 55-gallon tar coated drums were observed". If drums were only found in two locations, please revise the text. Soil samples should be collected beneath the location of the drums. This can be done as part of the confirmation samples following the removal action discussed on page 4-12.

EPA RPM Comment 9: *Page 4-5. "Not considered a CERCLA Source". This is still improper disposal which would be subject to Virginia State regulations.*

Response: The debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes and are not CERCLA-related wastes. Under 9VAC20-81-45(B)(2)(f), the open dump criteria does not apply to sites that are undergoing remediation per the requirements of CERCLA or the RCRA Corrective Action Program and are doing so with the department's and/or the Environmental Protection Agency's oversight. At this time, the Navy believes that the CERCLA action being taken at AOC 2 constitutes sufficient remedial action for the non-CERCLA wastes that were disposed of at the site.

EPA RPM Comment 9 Response: ok

EPA RPM Comment 10: *Page 4-6. The PCB discussion states that PCBs were detected above residential screening at the duplicate of A2-TP01, but then goes on to say that Aroclor 1260 was not detected in the soil at A2-TP01. Presumably the original A2-TP01 and its' duplicate were taken from the same location and not separate samples correct? I do realize it is possible for an original sample and a dup. to have different detections, but the paragraph implies one sample was within the waste and one was from the native soil below the waste. Also, it appears an interim removal action will be prepared to remove the waste from Area 2. This should be used as the rationale as to why the Aroclor 1260 detection is not of concern. Confirmation samples following the removal should include PCB analysis due to a high degree of uncertainty associated with the contaminants distribution.*

Response: The report text will be revised to clarify the PCB detection as follows:

"One PCB (Aroclor-1260) was detected in only one subsurface soil sample (310 µg/kg in the duplicate A2-TP01**F at Test Pit TP01**), slightly above the residential RSL (220 µg/kg) (Figure 4-7). However, the primary sample from this location was below screening criteria. **Both of** these subsurface soil samples**, A2-TP01F and its duplicate,** were collected within the debris zone at approximately 3.5 feet bgs. **However,** Aroclor-1260 was not detected in the native soil sample (A2-TP01**N**) collected from the bottom of Test Pit TP01 at 5 feet bgs. Therefore, Aroclor-1260 is likely a localized occurrence and not migrating from the debris material. PCBs tend to bind to soil and are not readily mobile."

While the interim removal action at AOC 2 precludes the Aroclor 1260 detection from being a concern, the interim removal action for AOC 2 is not introduced in the report until p. 4-12. Since mention of this removal action on p. 4-6 would disrupt the logical progression of information being presented in Section 4, this rationale has not been included on p. 4-6.

EPA RPM Comment 10 Response: ok

(NOTE: Comment 11 was not provided by the USEPA. Comments proceeded from Comment 10 to Comment 12)

EPA RPM Comment 12: *According to Figure 4-3 there is a "Significant Geophysical Anomaly" in the North West corner of the site that was not investigated.*

Response: Noted. During the 1998 geophysical investigation, a significant metallic response was identified in the EM-61 data in the northwest corner of the AOC 2 geophysical investigation area, as shown in Figure 4-3 of the SI report. However, as documented in Appendix A of the Final Field Investigation Report, Site 1 and AOC 2 (Baker, 1999), this anomaly was not identified as an anomaly that could not be explained by a surface object. Furthermore, the EM-31 quadrature data for AOC 2, also collected during the 1998 geophysical investigation, complemented most of the EM-61 and in-phase responses, but with less resolution. Based on review of the EM-31 data, "increases in terrain conductivity can be seen along the entire western edge of the grid. Although there are no metallic anomalies corresponding to this feature it was suggested by Baker personnel on site that this is the possible location of an abandoned railroad. The changes in terrain conductivity may be due to a nonmetallic but relatively conductive material that was used for the railroad bed" (Baker, 1999). While the Final Field Investigation Report does not state specifically why this northwest area was not investigated, it is assumed that the northwest anomaly was likely associated with the abandoned railroad bed.

EPA RPM Comment 12 Response: ok

EPA RPM Comment 13: *Areas 1b and Area 3 are dumps that don't appear to have to have been sampled according to the figures. Please provide rationale in a RTC as to why this would be acceptable. Presumably the response would be the types of materials disposed would not be expected to create contamination, however, it is highly that any disposing that occurred was an*

orderly disposal of specific material. Environmental sampling should be conducted to ensure there was no disposal of hazardous materials.

Response: Based on the AOC 2 test pit and test trenching logs, the debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes, which are not CERCLA-related wastes. No debris or waste was observed during the trenching activities to propose that hazardous materials were disposed at AOC 2. As such, the Navy does not believe that environmental sampling is necessary.

EPA RPM Comment 13 Response: ok

Section 5

EPA RPM Comment 14: *Page 5-4. 1918 Drum Storage Area. EPA suggests samples are collected and analyzed for VOCs, PCBs and Pesticides.*

Response: The constituents sampled for and analyzed during the CAX AOC SI, as listed in the Final SI Work Plan agreed to by the WPNSTA Yorktown/CAX Partnering Team, were based on the review of constituents detected during Weston's 1999 Site Inspection. As documented in the WPNSTA Yorktown/CAX Partnering Team Final 15 November 2007 Meeting Minutes, Rob Thomson (USEPA) requested that phthalates be added to the list of analytes to be sampled at AOC 6 during the SI. As such, SVOCs were added to the Final SI Work Plan. Based on the re-review of the 1999 and current AOC 6 SI analytical data, the Navy believes that no additional sampling and analysis for VOCs, PCBs, and Pesticides at the 1918 Drum Storage Area is necessary.

EPA RPM Comment 14 Response: Is there any historical evidence that suggests no drums or barrels containing any VOCs, PCBs, or Pesticides were not stored in this area (or is there any historical evidence to suggest what was stored onsite)?

EPA RPM Comment 15: *Page 5-10. Bis(2-ethylhexyl)phthalate. If the contaminant was likely attributed lab contamination, was it detected in the blanks?*

Response: The SVOC Bis(2-ethylhexyl)phthalate was not detected in any of the blanks and was inadvertently identified as exceeding the ecological screening value in the pre-Draft report, which listed the Screening Level Concentration (SCL) screening values as the eco screening criteria for sediment. The organic chemicals in sediment were actually screened against both SCL screening values and Equilibrium Partitioning (EqP) screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Appendix B, Table B-3. While the pre-draft tables included the SLC as the ecological screening value, the EqP was the actual screening value used for bis(2-Ethylhexyl)phthalate detected in the AOC 6 sediment samples, as listed in Table 5-11.

Specifically, as documented in Appendix B, pp. B-12 through B-13, Bis(2-ethylhexyl)phthalate exceeded the SLC screening value, but not the EqP screening value, based upon the maximum

detected concentration. However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC.

The text on p. 5-10, carried over from the pre-draft, inadvertently includes the SCL instead of the EqP. Based on this information, Bis(2-ethylhexyl)phthalate was not an initial COPC. Only one SVOC, 2,6-Dinitrotoluene, initially exceeded the ecological screening criteria. The text will be revised to state the following:

"SVOCs and Explosives

One SVOC, **2,6-Dinitrotoluene**, exceeded the **Equilibrium Partitioning (EqP) value of 187** µg/kg in one **sub**surface sediment sample (**SD02**, near the **Ammonia Settling Pits**) at a concentration of **260 µg/kg.** However**, since the mean HQ for 2,6-Dinitrotoluene was less than one, this constituent was not identified as a refined COPC during the ecological risk screening**. No other SVOCs or explosives exceeded their respective screening criterion in surface and --subsurface sediment samples."

EPA RPM Comment 15 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 16: *Page 5-12 Ammonia Settling Pits. Check with Rob to make sure the correct chemicals were analyzed for.*

Response: No response necessary. As instructed by the USEPA via email on August 23, 2011, this comment was a note by the USEPA reviewer and should be disregarded.

EPA RPM Comment 16 Response: ok

EPA RPM Comment 17: *Page 5-13. Ammonia Settling Pit. Groundwater Discussion. Averaging groundwater samples is not acceptable. See RPM General Comment.*

Response: The methodology used to screen and evaluate lead in the HHRS was described in Appendix A, page A-3, as follows "Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC for the AOC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009a). If the lead concentrations are greater than the action level, it is retained as a COPC for the AOC." The use of the average lead concentration is consistent with EPA guidance, as the average concentration is the concentration that is used when lead is evaluated using the IEUBK model.

EPA RPM Comment 17 Response: The maximum detect of lead in groundwater of 22 ug/L exceeds the federal action level. If the detection of lead was from a total metals analysis (and either not detected in the dissolved analysis or detected below the action level), then the case can be made for not carrying lead through as a COPC. However, this case is not presented above.

EPA RPM Comment 18: *Page 5-17. Mean HQ for Aluminum and Lead. See RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 18 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 19: *Page 5-17. DAF applied directly to groundwater sample. See EPA RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 19 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 20: *Page 5-18. Mean HQ for HMX and Mercury. See EPA RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 20 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 21: *Page 5-18. Groundwater discussion. Please see EPA RPM General Comment 1.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 21 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 22: *Page 5-19. Surface Soil. Bullets 1,2, and 3. See EPA RPM General Comments.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 22 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 23: *Penniman Lake Surface Water Discussion. The argument that the screening level of 4ppb for barium is conservative should be overcome by the fact that we exceeded it by nearly 5x as well as it being detected at multiple locations. Please refine Barium as a COPC in surface water.*

Response: The surface water screening value for barium (4 µg/L) is conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural water bodies but very toxic, while the surface water sample was measured for total barium. For comparison,

the USEPA Region 5 freshwater screening value for total barium is 200 µ/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 µ/L). This explanation will be added to the text of the SI and barium will not be identified as a COPC.

EPA RPM Comment 23 Response: Please see EPA General Comment 1 Response.

Section 6
EPA RPM Comment 24: *Page 6-5. Lead 984ppm. See EPA RPM General Comments.*

Response: Please see the response to Comment 17.

EPA RPM Comment 24 Response: Additional sampling should take place in the NW portion of the site near CAA07-SO03.

EPA RPM Comment 25: *Page 6-6. Groundwater. Lead. See RPM General Comments.*

Response: Please see the response to Comment 17.

EPA RPM Comment 25 Response: The maximum detect of lead in groundwater is 31 µg/L which exceeds EPAs screening value for lead. Typically the argument can be made that lead wasn't detected in the dissolved metals analysis. However, it doesn't appear dissolved lead was analyzed (?). Please carry through lead as a COPC, resample the wells for dissolved lead, or elevate the issue to tier 2.

EPA RPM Comment 26: *Page 6-7. Subsurface Soil. See RPM General Comments.*

Response: Please see the response to General Comment 2.

EPA RPM Comment 26 Response: Please see EPA General Comment 1 Response.

EPA RPM Comment 27: *Page 6-8. Groundwater. See EPA RPM General Comment.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 27 Response: Please see EPA General Comment 1 Response

EPA RPM Comment 28*: Page 6-8. Second to last word. Typo.*

Response: Corrected. The second to last word in the final sentence on p. 6-8, "work", has been revised to "word".

EPA RPM Comment 28 Response: Thank you.

EPA RPM Comment 29: *Former Drum Pile. Was GPR preformed on this AOC (I may have missed it)?*

Response: No, GPR has not been conducted in the vicinity of the Former Drum Pile.

EPA RPM Comment 29: ok

EPA RPM Comment 30: *Figure 6-4. From Figure 6-4 it does not appear that the actual nature of the pit has been characterized (although extent appears to have been defined). Since the path forward for the Site is a removal action, the only comment would be to analyze for a full suite of analytes during confirmation samples.*

Response: An expanded SI is recommended for AOC 7 (Drum Disposal and Can Pit Area) in order to verify the groundwater flow directions and to verify and characterize the extent of inorganic contamination. As indicated by the current SI analytical data, no VOCs, SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in soil, and no SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in groundwater. Only one VOC exceeded screening criteria in groundwater.

Prior to preparing the expanded SI work plan, the current SI analytical data will be reviewed and a focused list of analytes will be recommended based on the recent detections.

EPA RPM Comment 30 Response: The "current analytical data" consists of what appears to be only 1 sample within the actual footprint of the can pit. Constituents should not be eliminated based on 1 sample

Section 7
EPA RPM Comment 31: *Page 7-7. Mean Zinc. See RPM General Comments.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 30 Response: Please see EPA General Comment 1 Response

EPA RPM Comment 32: *Page 7-8. Groundwater. See RPM General Comments.*

Response: Please see the response to General Comment 1.

EPA RPM Comment 32 Response: see the response to General Comment 1.

Appendix A
EPA RPM Comment 33: *Page A-5. AOC 1 South. Lead 698ppm. See EPA RPM General Comment.*

Response: Please see the response to Comment 17.

EPA RPM Comment Response 33: Lead should be stepped out to the East.

EPA RPM Comment 34: *Page A-7. Iron discussion. This doesn't make sense. Although Iron is an essential human nutrient, there is some science that went in to the development HQ and screening values developed. If a chemical is exceeding the screening values we can't say "it is likely that exposure to iron at the concentrations present on the site would not result in any adverse health*

effects". That is essentially questioning the science that went in to the development of the risk numbers. Please revise.

Response: We will revise the paragraph discussing iron as follows to indicate that the maximum detected iron concentration would not result in an intake above the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. The following text will be added to Page A-7:

"Iron, the only contributor to the potential noncarcinogenic hazard is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample B03. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 8.8 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 18 mg/day iron (44,000 mg/kg x ingestion rate of 400 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children."

EPA RPM Comment 34 Response: ok

EPA RPM Comment 35: *Page A-7. Doesn't the RAGs Guidance caution against screening something out (Thallium) because it doesn't have a screening criteria? I believe it should be carried through.*

Response: Thallium was not carried through the screening tables because it was not possible to estimate any contribution to the cumulative hazard/risk associated with thallium. Between the draft and draft final document, the latest RSL update (June 2011) became available, and there are now RSLs for thallium. The thallium detections for all media for all AOCs were compared (not risk screened) to the new thallium RSLs:

- Res. Soil RSL: listed as .78 mg/kg, adjusted value .078 mg/kg
- Ind. Soil RSL: listed as 10 mg/kg, adjusted value 1 mg/kg
- GW Tapwater RSL: listed as .37 µg/L, adjusted value .037 µg/L
- SW RSL: listed as 3.7 µg/L, adjusted value 0.37 µg/L

The thallium concentrations exceeded the respective RSL for these AOCs and media and could potentially be a COPC:

AOC 2:

- Thallium in **SB** - sample CAA02-A2-TP02-N-1999 (0.84 L mg/kg)
- Total thallium in **GW** - samples CAA02-A2DPW01-1098 (1.2 L µg/L) and CAA02-A2DPW02-1098 (2 J µg/L)

AOC 6 – 1918 Drum Storage Area:

- Total thallium in **SB** - sample CAA06-SB16-1108 (0.08 J mg/kg)
- Total thallium in **GW** - samples CAA06-DW09-1108 (2.1 J UG/L), CAA06-DW10P-1108 (1.7 J µg/L), CAA06-DW11-1108 (2.2 J µg/L)
- Dissolved thallium in **GW** - sample CAA06-DW09-1108 (2 J µg/L)
-

AOC 6 TNT Areas:

- Thallium in **SS** – sample CAA06-SS03-1008 (0.18 J mg/kg)
- Thallium in **SW** - sample CAA06-SW01-1008 (1.7 J µg/L)

AOC 8:

- Thallium in **SS** - sample CAA08-SS01-1008 (0.08 J mg/kg)
- Dissolved thallium in **GW** - sample CAA08-DW04-1008 (1.9 J µg/L)

For AOC 2, thallium was not detected in the dissolved metals fraction in groundwater, thus the total results are likely attributable to suspended solids. The subsurface soil location where thallium exceeded the RSL is within the removal area that will be in the interim removal action area. Therefore, no change to the recommendations for AOC 2 is necessary.

For the AOC 6 – 1918 Drum Storage Area, since the SI recommendation was no further action, the human health risk screening for this area was re-run using the June 2011 RSLs (for all constituents, including thallium). Results of the updated risk screening continue to indicate that exposure to surface and subsurface soil within the 1918 Drum Storage Area would not result in any unacceptable risks. While exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals, this potential risks is based on total inorganics detected in the groundwater; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum was the only inorganic detected in the dissolved fraction and is likely attributable to background; therefore, no unacceptable human health risk above background is expected for groundwater. The no further action recommendation is still appropriate and no change to the SI report is necessary.

For the AOC 6 – TNT Areas surface soil, an RI is the recommended path forward for the AOC; thus, thallium will be evaluated as part of the HH risk assessment. Regarding the surface water sample, the total thallium concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 µg/L), but does not exceed the unadjusted screening level (tap water

RSL times ten, 3.7 µg/L). In addition, thallium was not detected in the dissolved fraction. No change to the SI report is necessary.

For AOC 8, the surface soil sample thallium concentration listed above was within the range of the residential RSL (considering significant figures). Regarding the AOC 8 groundwater, an RI is the recommended path forward; thus, thallium will be evaluated as part of the HH risk assessment and no change to the SI report is necessary.

The text in the individual AOC sections and Appendix A (the HH risk screen) will be revised, as appropriate, to reflect that there are now RSLs for thallium and the comparison to them and conclusions presented above. For the AOC 6 Drum Storage Area, the text, tables, and figures will be updated to reflect the revised HH risk screen.

EPA RPM Comment 36: *Page A-7. Aroclor-1260. Should be cumulative risk. See EPA RPM General Comments.*

Response: Agree. However, the point of this paragraph is to show that the risk is primarily associated with chromium, based on the assumption that all of the chromium is in the hexavalent form, and to identify the relative contribution from each of the carcinogenic COPCs.

EPA RPM Comment 36 Response: Page A-7 Subsurface soil. I do not understand the point of the final paragraph on page A-7. The prior paragraph states Aroclor 1260, arsenic, chromium, copper and iron were retained as COPCs (which is fine). However, the following paragraph goes on to discuss the individual risk associated with each individual compound stating they are within the acceptable level. (I do not believe the cumulative risk was within the acceptable range? That is the primary issue). For clarification, were Aroclor 1260, arsenic, chromium, copper and iron retained as COPCs?

EPA RPM Comment 37: *Page A-10. Ammonia Settling Pit Area. Lead. See RPM General Comments.*

Response: Please see the response to Comment 17.

EPA RPM Comment 37 Response: Please see the Comment 17 Response.

EPA Tox Comment 1: *In Section 2.4 of the report, the text should confirm that surface and subsurface soil samples were collected from original soil (not fill material), where contamination, if any, would likely be found.*

Response: For clarification, the report text in Section 2.4 will be revised as follows:

"Surface soil samples were collected from **native soil** 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, **non-native** deep subsurface soil samples were collected at AOCs 7 and 8 from the bottom of test pits

considered to be most impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris."

EPA Tox Comment 1 Response: Thank you, the response to comment is acceptable.

EPA Tox Comment 2: *According to Table 2-1, in terms of organics, only TCL SVOCs were considered at AOC 6. Why wasn't the full TCL suite considered? This could represent a data gap. Fortunately, most of the subareas in AOC 6 will move forward for additional investigation; however, the 1918 Drum Storage Area dropped out. Unless strong justification can be provided for this omission, consideration should be given to collecting additional samples from the 1918 Drum Storage Area to rule out the presence of VOCs, PCBs and pesticides in soil.*

Response: Please see the response to Comment 14.

EPA Tox Comment 2 Response: Thank you, the response to comment is acceptable.

EPA Tox General Comment: As we've discussed (both in-house and on a conference call with the Navy), there seems to be a protocol in place for evaluating Cheatham sites at the SI stage. That's fine, assuming that all partners agree with the established decision tree. However, it seems that when sites fail the screening, the Navy introduces additional (and not necessarily scientifically-sound) screening parameters to justify NFA. I understand that no one wants to unnecessarily propel sites into an RI, but we also can't allow sites that pose potentially significant risks to slip through the cracks. Further, if data gaps exist, they need to be filled (perhaps through an Extended SI) before a final conclusion can be drawn. Bottom line, risk management calls should primarily be reserved for situations where a site is well characterized and informed decisions can be made.

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5 – Navy's Response to USEPA's Additional Comments on the Draft SI Report

Additional Response To Comments

Draft Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA

January 3, 2012

Initial and additional comments were received by email on August 15, 2011 and December 2, 2011, respectively, from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3. The Navy's initial and additional responses were provided October 4, 2011 and January 3, 2012, respectively.

Comment provided via emai (8/15/11)l: *I have a number of issues with this. Although the general HH Risk screening process provided in appendix A is generally an acceptable and common approach, the document doesn't necessarily follow the process. Many of the chemicals are screened out based on inappropriate screening techniques (inconsistent with EPA Guidance) or judgment calls and not based on scientific evidence. While judgement call may be an acceptable way of proceeding as a site progresses through the CERCLA process, the high level of uncertainty (limited sample coverage) associated with a PA/SI makes these decisions premature.*

Response (10/4/11): The human health and ecological risk screenings conducted were carried out under the current USEPA and/or Navy ERA guidance. Based on a review of the available SI analytical data, the proposed paths forward for the various AOCs followed a logical scientific decision analysis and were not based on opinion. While there will always be a certain amount of uncertainty associated with any PA/SI, the Navy believes that the proposed recommendations were made based on sound scientific evidence; for those AOCs where uncertainty exists, further investigation has been proposed.

EPA Email Response (12/2/11): Noted

EPA RPM General Comment 1 (8/15/11): *There are a multiple instances in this document that are inconsistent with EPA Guidance and some revisions will need to be made or an explanation should be provided as to why they would be appropriate. Examples would be: averaging groundwater samples, applying dilution attenuation factors directly to groundwater samples (typically DAFs are used for and applied to soil migration to groundwater), screening risks from individual chemical against the 5x10-5 cancer and 0.5 HQ screening level (should be cumulative risk for the site not on a per chemical basis), and taking the mean HQ of soil samples and screening them out.*

Further, much of the above is not consistent with the Human Health Screening Methodology (A.2) in Appendix A of this document.

Response (10/4/11): The ecological risk screening methodology was outlined in Appendix B, Section B.2, on which there were no comments. Three of the four examples provided in the comment appear to apply to the ecological screenings. The rationale for using mean groundwater concentrations and dilution factors (not DAFs) in the refined step of the ecological groundwater screenings, and mean soil concentrations in the refined step of the ecological soil screenings, are provided in Appendix B, Section B.2. None of the methods used are known to be precluded in EPA or Navy ERA guidance.

In terms of the HHRA, the only time the average groundwater (or soil) concentration is used is when considering lead. This is because the method used to evaluate lead (the IEUBK model) uses the average concentration of lead as the input value for the model. The identification of the potential for carcinogenic risk or hazard is based on the cumulative risk and cumulative hazard (per target organ). However, to understand which constituents contribute the most to these cumulative risks or hazards, we do point out if individual constituents exceed these levels or not, but it is not used to identify if the site may pose an unacceptable risk or hazard or not. These discussions are presented to supply further information about the site and potential contamination detected at the site.

EPA General Comment 1 Response (12/2/11): EPA's initial belief was that the sole purpose of the report was to determine whether further action would be needed at these AOCs. EPA BTAG will now be reviewing the document and appendices due to the potential ramifications of the report (eliminating COPC etc…).

Additional Response (1/3/12): Noted. Also, please note that the draft final document reflects items (e.g., no longer comparing results to maximum background values; explaining the substitute values used when a constituent does not have an ecological screening value; etc.) from the October 26, 2011 and November 7, 2011 conference calls and the November 2011 Partnering meeting discussion. While a refinement of the COPCs (Step 2b) is presented in the report, the recommendations for each AOC (Step 3) are adequate. For example, Step 2b for AOC 8 surface soil did not retain chromium and arsenic as COPCs, based on the argument that chromium was evaluated as hexavalent but is likely in the trivalent form; however, an RI is the recommend path for AOC 8, including collecting soil samples for inorganic analysis.

EPA RPM General Comment 2 (8/15/11): *A number of chemicals which did not have screening values were screened out by being compared to screening values of other similar explosives. Please provide the actual compound they were compared to, the actual screening value used, and how that number was developed. Please revise each instance of this in the document for transparency purposes (note that not all instances of this are noted in the comments).*

Response (10/4/11): For the ecological screenings, there were five instances (all in soil) where this occurred. In these cases, the soil concentrations for the explosives without a screening value were compared with the range of screening values for all other explosives with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg (not including perchlorate, which is not technically an explosive). This explanation will be added to the bullets for the five relevant occurrences.

EPA General Comment 2 Response (12/2/11): See EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1. In addition, the explanations have been added to the draft final.

EPA RPM General Comment 3 (8/15/11): *Please include risk screening tables similar to the Example Risk Screening tables (attached) at the end of each Section for transparency purposes. These tables should include all COPCs that passed through the screening process.*

Response (10/4/11): Summary tables listing the COPCs that passed through the screening process at each AOC are included as the final table in each AOC section of the report. Specifically, these COPCs are included in the Decision Summary tables, which include Tables 3-7, 4-4, 5-12, 6-4, and 7-4.

The Decision Summary tables were prepared to consolidate the results of the human health and ecological risk screenings steps. Detailed tables listing the risk screening calculations are included in Appendices A and B.

Since all of the COPCs that passed through the screening process are included in the general Decision Summary tables, as well as in detail within Appendices A and B, the Navy believes that no revision of the risk screening tables is necessary.

EPA RPM General Comment 3 Response (12/2/11): ok

Section 2

EPA RPM Comment 1 (8/15/11): *Page 2-1. Although the investigation methodology etc… from the previous investigation are not included in the report, I assuming all sample data are. Correct?*

Response (10/4/11): The available historical sample data from previous investigations at AOC 1, AOC 2, AOC 6, and AOC 8 are included in Appendix G, Historical Analytical Data. For clarification, the text on page 3-3 will be revised to state:

"With the exception of arsenic (7.4 mg/kg) in sediment, only low, estimated levels of phthalates, ethylbenzene and xylenes near reporting limits were detected in historical surface water and sediment samples (**Tables G-3 and G-4, Appendix G**)."

EPA RPM Comment 1 Response (12/2/11): Please indicate whether the data was included in the risk evaluation.

Additional Response (1/3/12): The report text has been revised to identify the data that was included in the risk evaluations by adding the following sentence to the end of the 3rd paragraph on page 2-1:

"With the exception of the AOC 2 historical data, only the 2008 SI analytical data were used in the human health and ecological risk screenings conducted for AOCs 1, 6, 7, and 8."

Section 3

EPA RPM Comment 2 (8/15/11): *Page 3-13. This is an incorrect application of dilution attenuation factors. DAF are utilized the project what we may see in groundwater from a soil sample value. Applying a DAF directly to a groundwater sample makes no sense and is not consistent with EPA guidance. Please revise.*

Response (10/4/11): These are dilution factors, not DAFs, as described in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 2 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 3 (8/15/11): *Page 3-15. Groundwater. It is unclear as to why we would average groundwater samples. Wells should be evaluated on a per well basis.*

Response (10/4/11): The rationale is provided in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 3 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 4 (8/15/11): *Page 3-17. Eco Risk Evaluation. Eco Risks should be calculated for these sites. Although the size of the sites may be small, they are essentially all habitat (forested cover etc… not a parking lot).*

Response (10/4/11): Potential ecological risks were evaluated for these sites, as provided in Section 3.2.4 and Appendix B. The page referenced in the comment provides a summary of the results. The small size of the sites was included as a factor explaining why the risks are likely to be low (i.e., they would be limited, spatially). Consideration of such factors is consistent with the ecological risk screening methodology provided in Appendix B, Section B.2.

EPA RPM Comment 4 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please note that the Step 3 recommendation does include sampling for inorganics, which covers all of the COPCs for ecological risk at AOC 1, except two - endrin and endrin aldehyde. The highest detections of endrin (3.3J µg/kg) and endrin aldehyde (3.1J µg/kg) in the AOC 1 surface soil are slightly above the ecological screening value (1.95 ug/kg for both) and are well below 50 µg/kg, indicating normal pesticide application.

EPA RPM Comment 5 (8/15/11): *Page 3-17. It is highly unlikely that an Arsenic hit of nearly 50ppm at CAA01-SO04 from Table 3-1 is attributed to background. This is almost an order of magnitude above our background number. Please carry Arsenic through as a COPC.*

Response (10/4/11): While the maximum arsenic concentration of 47.5 L mg/kg in surface soil at CAA01-SO04 exceeded the respective base background UTL for arsenic (6.36 mg/kg) by almost an order of magnitude, the maximum arsenic concentration in this sample did not exceed the maximum base background for arsenic (63.9 mg/kg). As such, the maximum concentration detected in surface soil is likely attributable to natural background conditions, as documented in the first bullet on page 3-5. Based on this information, arsenic was not carried through as a COPC during the risk screening process.

EPA RPM Comment 5 Response (12/2/11): EPA does not agree with eliminating Arsenic as a COPC as part of a SI risk screening process. Please carry through arsenic as a COPC or elevate the issue to tier 2.

Additional Response (1/3/12): As agreed to by the Partnering Team on Nov. 16, 2011, the SI analytical data will not be compared against the maximum background UTLs. The text in Sections 3.2.4, 3.3.2 and 3.3.3 has been revised to remove the former maximum background argument, and arsenic and chromium are now identified as COPCs.

(NOTE: Comment 6 was not provided by the USEPA. Comments proceeded from Comment 5 to Comment 7)

Section 4

EPA RPM Comment 7 (8/15/11): *AOC 2 should be considered a solid waste landfill which would be subject to Virginia State regulations.*

Response (10/4/11): AOC 2 is excluded from regulation under 9 VAC 20-81 by 9 VAC 20-81-35(E) and 9 VAC 20-81 45(B)(2)(f) since it is being remediated under CERCLA and ceased disposal operations prior to regulation.

EPA RPM Comment 7 Response (12/2/11): Noted.

EPA RPM Comment 8 (8/15/11): *Page 4-3. A number of drums were found in the area of AOC2TT05-AOC2TT10, AOC2TT13 and AOC2TT14, yet no samples were collected in this area according to Figures 4-4, 4-5, and 4-6. Please collect samples from this area.*

Response (10/4/11): As documented in Attachment B of the *Final Trenching Letter Report, Site 1, Site 4, and AOC 2* (Baker, 2002), empty 55-gallon drums were observed only in test

trenches AOC2TT13 and AOC2TT14; no drums were observed in test trenches AOC2TT05 through AOC2TT10. No samples were collected during the most recent AOC 2 field investigation in 2001.

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 (Figures 4-4 and 4-5). Prior to finalization of the Final SI Work Plan, during a phone conversation with CH2M HILL, the Navy RPM, and USEPA on September 12, 2008, the USEPA agreed that no additional sampling at AOC 2 was required during the SI as long as the respirator cartridges were removed. The Navy agreed, and as documented in the Response to Comments on the Draft Final Work Plan submitted to the WPNSTA Yorktown/CAX Partnering Team, "…the Navy plans on conducting a removal action to address the existing respirator cartridges, …".

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 that contains the respirator cartridges (Figures 4-4 and 4-5) that will be removed during an EE/CA that will be performed at AOC 2. Since confirmation sampling is planned as part of the EE/CA, the Navy believes sampling of the area where the drums were observed is not necessary.

EPA RPM Comment 8 Response (12/2/11): The text currently states, "In eight of these trenches (AOC2TT05 through AOC2TT10, AOC2TT13, and AOCTT14) dextrose bottles, some clothing, metal debris, and empty 55-gallon tar coated drums were observed". If drums were only found in two locations, please revise the text. Soil samples should be collected beneath the location of the drums. This can be done as part of the confirmation samples following the removal action discussed on page 4-12.

Additional Response (1/3/12): The drums were only found at two of the test trench locations, AOC2TT13 and AOC2TT14. The text has been revised as follows:

"In six of these trenches (AOC2TT05 through AOC2TT10) dextrose bottles, some clothing, and metal debris were observed and empty 55-gallon tar-coated drums were observed in trenches AOC2TT13 and AOC2TT14."

The locations of test trenches AOC2TT13 and AOC2TT14 are within Area 2 recommended for an interim removal action. As requested, confirmation sampling will be conducted beneath the two locations where the empty drums were observed.

EPA RPM Comment 9 (8/15/11): *Page 4-5. "Not considered a CERCLA Source". This is still improper disposal which would be subject to Virginia State regulations.*

Response (10/4/11): The debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes and are not CERCLA-related wastes. Under 9VAC20-81-45(B)(2)(f), the open dump criteria does not apply to sites that are undergoing remediation per the requirements of CERCLA or the RCRA Corrective Action Program and are doing so with the department's and/or the Environmental Protection Agency's oversight. At this time, the Navy believes that the CERCLA action being taken at AOC 2 constitutes sufficient remedial action for the non-CERCLA wastes that were disposed of at the site.

EPA RPM Comment 9 Response (12/2/11): ok

EPA RPM Comment 10 (8/15/11): *Page 4-6. The PCB discussion states that PCBs were detected above residential screening at the duplicate of A2-TP01, but then goes on to say that Aroclor 1260 was not detected in the soil at A2-TP01. Presumably the original A2-TP01 and its' duplicate were taken from the same location and not separate samples correct? I do realize it is possible for an original sample and a dup. to have different detections, but the paragraph implies one sample was within the waste and one was from the native soil below the waste. Also, it appears an interim removal action will be prepared to remove the waste from Area 2. This should be used as the rationale as to why the Aroclor 1260 detection is not of concern. Confirmation samples following the removal should include PCB analysis due to a high degree of uncertainty associated with the contaminants distribution.*

Response (10/4/11): The report text will be revised to clarify the PCB detection as follows:

"One PCB (Aroclor-1260) was detected in only one subsurface soil sample (310 µg/kg in the duplicate A2-TP01**F at Test Pit TP01**), slightly above the residential RSL (220 µg/kg) (Figure 4-7). However, the primary sample from this location was below screening criteria. **Both of** these subsurface soil samples**, A2-TP01F and its duplicate,** were collected within the debris zone at approximately 3.5 feet bgs. **However,** Aroclor-1260 was not detected in the native soil sample (A2-TP01**N**) collected from the bottom of Test Pit TP01 at 5 feet bgs. Therefore, Aroclor-1260 is likely a localized occurrence and not migrating from the debris material. PCBs tend to bind to soil and are not readily mobile."

While the interim removal action at AOC 2 precludes the Aroclor 1260 detection from being a concern, the interim removal action for AOC 2 is not introduced in the report until p. 4-12. Since mention of this removal action on p. 4-6 would disrupt the logical progression of information being presented in Section 4, this rationale has not been included on p. 4-6.

EPA RPM Comment 10 Response (12/2/11): ok

(NOTE: Comment 11 was not provided by the USEPA. Comments proceeded from Comment 10 to Comment 12)

EPA RPM Comment 12 (8/15/11): *According to Figure 4-3 there is a "Significant Geophysical Anomaly" in the North West corner of the site that was not investigated.*

Response (10/4/11): Noted. During the 1998 geophysical investigation, a significant metallic response was identified in the EM-61 data in the northwest corner of the AOC 2 geophysical investigation area, as shown in Figure 4-3 of the SI report. However, as documented in Appendix A of the Final Field Investigation Report, Site 1 and AOC 2 (Baker, 1999), this anomaly was not identified as an anomaly that could not be explained by a surface object. Furthermore, the EM-31 quadrature data for AOC 2, also collected during the 1998 geophysical investigation, complemented most of the EM-61 and in-phase responses, but with less resolution. Based on review of the EM-31 data, "increases in terrain conductivity can be seen along the entire western edge of the grid. Although there are no metallic anomalies corresponding to this feature it was

suggested by Baker personnel on site that this is the possible location of an abandoned railroad. The changes in terrain conductivity may be due to a nonmetallic but relatively conductive material that was used for the railroad bed" (Baker, 1999). While the Final Field Investigation Report does not state specifically why this northwest area was not investigated, it is assumed that the northwest anomaly was likely associated with the abandoned railroad bed.

EPA RPM Comment 12 Response (12/2/11): ok

EPA RPM Comment 13 (8/15/11): *Areas 1b and Area 3 are dumps that don't appear to have to have been sampled according to the figures. Please provide rationale in a RTC as to why this would be acceptable. Presumably the response would be the types of materials disposed would not be expected to create contamination, however, it is highly that any disposing that occurred was an orderly disposal of specific material. Environmental sampling should be conducted to ensure there was no disposal of hazardous materials.*

Response (10/4/11): Based on the AOC 2 test pit and test trenching logs, the debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes, which are not CERCLA-related wastes. No debris or waste was observed during the trenching activities to propose that hazardous materials were disposed at AOC 2. As such, the Navy does not believe that environmental sampling is necessary.

EPA RPM Comment 13 Response (12/2/11): ok

Section 5
EPA RPM Comment 14 (8/15/11): *Page 5-4. 1918 Drum Storage Area. EPA suggests samples are collected and analyzed for VOCs, PCBs and Pesticides.*

Response (10/4/11): The constituents sampled for and analyzed during the CAX AOC SI, as listed in the Final SI Work Plan agreed to by the WPNSTA Yorktown/CAX Partnering Team, were based on the review of constituents detected during Weston's 1999 Site Inspection. As documented in the WPNSTA Yorktown/CAX Partnering Team Final 15 November 2007 Meeting Minutes, Rob Thomson (USEPA) requested that phthalates be added to the list of analytes to be sampled at AOC 6 during the SI. As such, SVOCs were added to the Final SI Work Plan. Based on the re-review of the 1999 and current AOC 6 SI analytical data, the Navy believes that no additional sampling and analysis for VOCs, PCBs, and Pesticides at the 1918 Drum Storage Area is necessary.

EPA RPM Comment 14 Response (12/2/11): Is there any historical evidence that suggests no drums or barrels containing any VOCs, PCBs, or Pesticides were not stored in this area (or is there any historical evidence to suggest what was stored onsite)?

Additional Response (1/3/12): Presently, no historical evidence has been found documenting the contents of the drums or barrels in the 1918 Drum Storage Area. Based on a power point presentation dated January 2004 ("Cheatham Annex Penniman AOC Desk Top Study & Discussion Update", unknown author), a review of a 1918 photograph indicates that wooden kegs, stacked on sides and

empty, are observed. Additionally, the kegs were stored while the shell loading area was active and "Amatol records similar kegs used for storing Ammonium Nitrate".

No documentation has been found verifying whether or not ammonium nitrate was originally stored in the wooden barrels observed in the 1918 Drum Storage Area. However, explosives were not detected in any of the surface soil, subsurface soil, or groundwater samples collected and analyzed during the 2008 SI.

EPA RPM Comment 15 (8/15/11): *Page 5-10. Bis(2-ethylhexyl)phthalate. If the contaminant was likely attributed lab contamination, was it detected in the blanks?*

Response (10/4/11): The SVOC Bis(2-ethylhexyl)phthalate was not detected in any of the blanks and was inadvertently identified as exceeding the ecological screening value in the pre-Draft report, which listed the Screening Level Concentration (SCL) screening values as the eco screening criteria for sediment. The organic chemicals in sediment were actually screened against both SCL screening values and Equilibrium Partitioning (EqP) screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Appendix B, Table B-3. While the pre-draft tables included the SLC as the ecological screening value, the EqP was the actual screening value used for bis(2-Ethylhexyl)phthalate detected in the AOC 6 sediment samples, as listed in Table 5-11.

Specifically, as documented in Appendix B, pp. B-12 through B-13, Bis(2-ethylhexyl)phthalate exceeded the SLC screening value, but not the EqP screening value, based upon the maximum detected concentration. However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC.

The text on p. 5-10, carried over from the pre-draft, inadvertently includes the SCL instead of the EqP. Based on this information, Bis(2-ethylhexyl)phthalate was not an initial COPC. Only one SVOC, 2,6-Dinitrotoluene, initially exceeded the ecological screening criteria. The text will be revised to state the following:

"SVOCs and Explosives

One SVOC, **2,6-Dinitrotoluene**, exceeded the **Equilibrium Partitioning (EqP) value of 187** µg/kg in one **sub**surface sediment sample (**SD02**, near the **Ammonia Settling Pits**) at a concentration of **260 µg/kg.** However**, since the mean HQ for 2,6-Dinitrotoluene was less than one, this constituent was not identified as a refined COPC during the ecological risk screening**. No other SVOCs or explosives exceeded their respective screening criterion in surface and --subsurface sediment samples."

EPA RPM Comment 15 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 16 (8/15/11): *Page 5-12 Ammonia Settling Pits. Check with Rob to make sure the correct chemicals were analyzed for.*

Response (10/4/11): No response necessary. As instructed by the USEPA via email on August 23, 2011, this comment was a note by the USEPA reviewer and should be disregarded.

EPA RPM Comment 16 Response (12/2/11): ok

EPA RPM Comment 17 (8/15/11): *Page 5-13. Ammonia Settling Pit. Groundwater Discussion. Averaging groundwater samples is not acceptable. See RPM General Comment.*

Response (10/4/11): The methodology used to screen and evaluate lead in the HHRS was described in Appendix A, page A-3, as follows "Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC for the AOC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009a). If the lead concentrations are greater than the action level, it is retained as a COPC for the AOC." The use of the average lead concentration is consistent with EPA guidance, as the average concentration is the concentration that is used when lead is evaluated using the IEUBK model.

EPA RPM Comment 17 Response (12/2/11): The maximum detect of lead in groundwater of 22 ug/L exceeds the federal action level. If the detection of lead was from a total metals analysis (and either not detected in the dissolved analysis or detected below the action level), then the case can be made for not carrying lead through as a COPC. However, this case is not presented above.

Additional Response (1/3/12): Lead was not detected in the dissolved phase and a sentence to clarify this has been added to the referenced section. Regardless, the recommended path forward for the Ammonia Settling Pit is to conduct an ESI for groundwater, to include permanent monitoring wells and inorganics analysis, so lead will be evaluated again.

EPA RPM Comment 18 (8/15/11): *Page 5-17. Mean HQ for Aluminum and Lead. See RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 18 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1. ***EPA RPM Comment 19 (8/15/11):*** *Page 5-17. DAF applied directly to groundwater sample. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 19 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 20 (8/15/11): *Page 5-18. Mean HQ for HMX and Mercury. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 20 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 21 (8/15/11): *Page 5-18. Groundwater discussion. Please see EPA RPM General Comment 1.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 21 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 22 (8/15/11): *Page 5-19. Surface Soil. Bullets 1,2, and 3. See EPA RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 22 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 23 (8/15/11): *Penniman Lake Surface Water Discussion. The argument that the screening level of 4ppb for barium is conservative should be overcome by the fact that we exceeded it by nearly 5x as well as it being detected at multiple locations. Please refine Barium as a COPC in surface water.*

Response (10/4/11): The surface water screening value for barium (4 µg/L) is conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural

water bodies but very toxic, while the surface water sample was measured for total barium. For comparison, the USEPA Region 5 freshwater screening value for total barium is 200 µ/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 µ/L). This explanation will be added to the text of the SI and barium will not be identified as a COPC.

EPA RPM Comment 23 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1. Also, please note, an RI for Penniman Lake is planned; therefore, any future surface water or sediment work would be conducted under that project and not as part of any follow-up investigation for AOC 6. The Partnering Team discussed and agreed to this approach during November 2011 Partnering.

Section 6

EPA RPM Comment 24 (8/15/11): *Page 6-5. Lead 984ppm. See EPA RPM General Comments.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 24 Response (12/2/11): Additional sampling should take place in the NW portion of the site near CAA07-SO03.

Additional Response (1/3/12): A removal action to address surface soil inorganic contamination around location SO03 is recommended. Confirmation samples will be collected.

EPA RPM Comment 25 (8/15/11): *Page 6-6. Groundwater. Lead. See RPM General Comments.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 25 Response (12/2/11): The maximum detect of lead in groundwater is 31 ug/L which exceeds EPAs screening value for lead. Typically the argument can be made that lead wasn't detected in the dissolved metals analysis. However, it doesn't appear dissolved lead was analyzed (?). Please carry through lead as a COPC, resample the wells for dissolved lead, or elevate the issue to tier 2.

Additional Response (1/3/12): The AOC 7 groundwater samples were analyzed for dissolved lead; however, the concentrations of dissolved lead were all "B" qualified, indicating that lead was not detected above the level reported in the blanks. Based on the average concentration of total lead, 10 ug/L, which is below the 15 ug/L lead screening level, lead was not carried through as a COPC in groundwater at AOC 7. Nonetheless, the recommended path forward for AOC 7 groundwater is an ESI, including the installation of permanent monitoring wells and inorganic analysis, so lead will be evaluated again.

EPA RPM Comment 26 (8/15/11): *Page 6-7. Subsurface Soil. See RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 2.

EPA RPM Comment 26 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 27 (8/15/11): *Page 6-8. Groundwater. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 27 Response (12/2/11): Please see EPA General Comment 1 Response

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 28 (8/15/11)*: Page 6-8. Second to last word. Typo.*

Response (10/4/11): Corrected. The second to last word in the final sentence on p. 6-8, "work", has been revised to "word".

EPA RPM Comment 28 Response (12/2/11): Thank you.

EPA RPM Comment 29 (8/15/11): *Former Drum Pile. Was GPR preformed on this AOC (I may have missed it)?*

Response (10/4/11): No, GPR has not been conducted in the vicinity of the Former Drum Disposal Area.

EPA RPM Comment 29 (12/2/11): ok

EPA RPM Comment 30 (8/15/11): *Figure 6-4. From Figure 6-4 it does not appear that the actual nature of the pit has been characterized (although extent appears to have been defined). Since the path forward for the Site is a removal action, the only comment would be to analyze for a full suite of analytes during confirmation samples.*

Response (10/4/11): An expanded SI is recommended for AOC 7 (Drum Disposal and Can Pit Area) in order to verify the groundwater flow directions and to verify and characterize the extent of inorganic contamination. As indicated by the current SI analytical data, no VOCs, SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in soil, and no SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in groundwater. Only one VOC exceeded screening criteria in groundwater.

Prior to preparing the expanded SI work plan, the current SI analytical data will be reviewed and a focused list of analytes will be recommended based on the recent detections.

EPA RPM Comment 30 Response (12/2/11): The "current analytical data" consists of what appears to be only 1 sample within the actual footprint of the can pit. Constituents should not be eliminated based on 1 sample.

Additional Response (1/3/12): Sorry that the previous response discussed the path forward for the AOC 7 groundwater and did not address Comment 30. Yes, there was one sample location within the can pit, from which two soil samples (surface and subsurface) were collected. The footprint of the can pit is rather small (~30 feet long and 20 feet wide); therefore, the sample is representative of conditions and can be considered "worst case scenario." The recommendation for the can pit is a removal action with confirmation sampling. The recommended confirmation sampling is for inorganic constituents, not full suite. The Navy feels it is acceptable to leave the SI recommendations as they are and let the Partnering Team discuss the confirmation sample analyte list during the EE/CA preparation.

Section 7
EPA RPM Comment 31 (8/15/11): *Page 7-7. Mean Zinc. See RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 30 Response (12/2/11): Please see EPA General Comment 1 Response

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 32 (8/15/11): *Page 7-8. Groundwater. See RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 32 Response (12/2/11): see the response to General Comment 1.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

Appendix A
EPA RPM Comment 33 (8/15/11): *Page A-5. AOC 1 South. Lead 698ppm. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment Response 33 (12/2/11): Lead should be stepped out to the East.

Additional Response (1/3/12): The recommended path forward for AOC 1 South is an ESI to further verify and characterize the extent of SVOC (PAHs) and inorganic contamination "hot spot" areas; therefore, lead will be evaluated again. As far as sample locations are concerned, those details will be worked out during the ESI scoping session and included in the ESI UFP-SAP. The Navy feels it is acceptable to leave the SI recommendations as they are and let the Partnering Team discuss the sample locations during the ESI scoping session.***EPA RPM Comment 34 (8/15/11):*** *Page A-7. Iron discussion. This doesn't make sense. Although Iron is an essential human nutrient, there is some science that went in to the development HQ and screening values developed. If a chemical is exceeding the screening values we can't say "it is likely that exposure to iron at the concentrations present on the site would not result in any adverse health*

effects". That is essentially questioning the science that went in to the development of the risk numbers. Please revise.

Response (10/4/11): We will revise the paragraph discussing iron as follows to indicate that the maximum detected iron concentration would not result in an intake above the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. The following text will be added to Page A-7:

"Iron, the only contributor to the potential noncarcinogenic hazard is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA02-A2-DPB03-00-1098. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 8.8 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 18 mg/day iron (44,000 mg/kg x ingestion rate of 400 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children."

EPA RPM Comment 34 Response (12/2/11): ok

Additional Response (1/3/12): Also note that although the main text may state the exposure to iron is not likely to have adverse effects, iron is carried through as a COPC.

EPA RPM Comment 35 (8/15/11): *Page A-7. Doesn't the RAGs Guidance caution against screening something out (Thallium) because it doesn't have a screening criteria? I believe it should be carried through.*

Response (10/4/11): Thallium was not carried through the screening tables because it was not possible to estimate any contribution to the cumulative hazard/risk associated with thallium. Between the draft and draft final document, the latest RSL update (June 2011) became available, and there are now RSLs for thallium. The thallium detections for all media for all AOCs were compared (not risk screened) to the new thallium RSLs:

- Res. Soil RSL: listed as .78 mg/kg, adjusted value .078 mg/kg
- Ind. Soil RSL: listed as 10 mg/kg, adjusted value 1 mg/kg
- GW Tapwater RSL: listed as .37 µg/L, adjusted value .037 µg/L
- SW RSL: listed as 3.7 µg/L, adjusted value 0.37 µg/L

The thallium concentrations exceeded the respective RSL for these AOCs and media and could potentially be a COPC:

AOC 2:

- Thallium in **SB** - sample CAA02-A2-TP02-N-1999 (0.84 L mg/kg)
- Total thallium in **GW** - samples CAA02-A2DPW01-1098 (1.2 L µg/L) and CAA02-A2DPW02-1098 (2 J µg/L)

AOC 6 – 1918 Drum Storage Area:

- Total thallium in **SB** - sample CAA06-SB16-1108 (0.08 J mg/kg)
- Total thallium in **GW** - samples CAA06-DW09-1108 (2.1 J UG/L), CAA06-DW10P-1108 (1.7 J µg/L), CAA06-DW11-1108 (2.2 J µg/L)
- Dissolved thallium in **GW** - sample CAA06-DW09-1108 (2 J µg/L)
-

AOC 6 TNT Areas:

- Thallium in **SS** – sample CAA06-SS03-1008 (0.18 J mg/kg)
- Thallium in **SW** - sample CAA06-SW01-1008 (1.7 J µg/L)

AOC 8:

- Thallium in **SS** - sample CAA08-SS01-1008 (0.08 J mg/kg)
- Dissolved thallium in **GW** - sample CAA08-DW04-1008 (1.9 J µg/L)

For AOC 2, thallium was not detected in the dissolved metals fraction in groundwater, thus the total results are likely attributable to suspended solids. The subsurface soil location where thallium exceeded the RSL is within the removal area that will be in the interim removal action area. Therefore, no change to the recommendations for AOC 2 is necessary.

For the AOC 6 – 1918 Drum Storage Area, since the SI recommendation was no further action, the human health risk screening for this area was re-run using the June 2011 RSLs (for all constituents, including thallium). Results of the updated risk screening continue to indicate that exposure to surface and subsurface soil within the 1918 Drum Storage Area would not result in any unacceptable risks. While exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals, this potential risks is based on total inorganics detected in the groundwater; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum was the only inorganic detected in the dissolved fraction and is likely attributable to background; therefore, no unacceptable human health risk above background is expected for groundwater. The no further action recommendation is still appropriate and no change to the SI report is necessary.

For the AOC 6 – TNT Areas surface soil, an RI is the recommended path forward for the AOC; thus, thallium will be evaluated as part of the HH risk assessment. Regarding the surface water sample, the total thallium concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 µg/L), but does not exceed the unadjusted screening level (tap water RSL times ten, 3.7 µg/L). In addition, thallium was not detected in the dissolved fraction. No change to the SI report is necessary.

For AOC 8, the surface soil sample thallium concentration listed above was within the range of the residential RSL (considering significant figures). Regarding the AOC 8 groundwater, an RI is the recommended path forward; thus, thallium will be evaluated as part of the HH risk assessment and no change to the SI report is necessary.

The text in the individual AOC sections and Appendix A (the HH risk screen) will be revised, as appropriate, to reflect that there are now RSLs for thallium and the comparison to them and conclusions presented above. For the AOC 6 Drum Storage Area, the text, tables, and figures will be updated to reflect the revised HH risk screen.

EPA RPM Comment 36 (8/15/11): *Page A-7. Aroclor-1260. Should be cumulative risk. See EPA RPM General Comments.*

Response (10/4/11): Agree. However, the point of this paragraph is to show that the risk is primarily associated with chromium, based on the assumption that all of the chromium is in the hexavalent form, and to identify the relative contribution from each of the carcinogenic COPCs.

EPA RPM Comment 36 Response (12/2/11): Page A-7 Subsurface soil. I do not understand the point of the final paragraph on page A-7. The prior paragraph states Aroclor 1260, arsenic, chromium, copper and iron were retained as COPCs (which is fine). However, the following paragraph goes on to discuss the individual risk associated with each individual compound stating they are within the acceptable level. (I do not believe the cumulative risk was within the acceptable range? That is the primary issue). For clarification, were Aroclor 1260, arsenic, chromium, copper and iron retained as COPCs?

Additional Response (1/3/12): Yes, they are retained as COPCs (see main text, page 4-12).

EPA RPM Comment 37 (8/15/11): *Page A-10. Ammonia Settling Pit Area. Lead. See RPM General Comments.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 37 Response (12/2/11): Please see the Comment 17 Response.

Additional Response (1/3/12): Please see the additional response provided to the Comment 17 Response.

EPA Tox Comment 1 (8/15/11): *In Section 2.4 of the report, the text should confirm that surface and subsurface soil samples were collected from original soil (not fill material), where contamination, if any, would likely be found.*

Response (10/4/11): For clarification, the report text in Section 2.4 will be revised as follows:

"Surface soil samples were collected from **native soil** 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, **non-native** deep subsurface soil samples were collected at AOCs 7 and 8 from the bottom of test pits considered to be most impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris."

EPA Tox Comment 1 Response (12/2/11): Thank you, the response to comment is acceptable.

Additional Response (1/3/12): The above text revision indicates non-native deep subsurface soil samples were collected at AOC 7 and that is not the case, as the vertical extent of waste was delineated at AOC 7. Therefore, the above revision has been further refined as follows:

"Surface soil samples were collected from native soil 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, deep subsurface soil samples were collected at AOC 7 (native subsurface soil samples CAA07-SBTP04-1008, CAA07-SBTP06-1008, and CAA07-SBTO05-1008) and AOC 8 (native subsurface soil samples CAA08-SBTP14-1008 and CAA08-SBTP24-1008; non-native soil sample CAA08-SBTP19-1008) from the bottom of test pits considered to be potentially impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris."

EPA Tox Comment 2 (8/15/11): *According to Table 2-1, in terms of organics, only TCL SVOCs were considered at AOC 6. Why wasn't the full TCL suite considered? This could represent a data gap. Fortunately, most of the subareas in AOC 6 will move forward for additional investigation; however, the 1918 Drum Storage Area dropped out. Unless strong justification can be provided for this omission, consideration should be given to collecting additional samples from the 1918 Drum Storage Area to rule out the presence of VOCs, PCBs and pesticides in soil.*

Response (10/4/11): Please see the response to Comment 14.

EPA Tox Comment 2 Response (12/2/11): Thank you, the response to comment is acceptable.

EPA Tox General Comment (12/2/11): As we've discussed (both in-house and on a conference call with the Navy), there seems to be a protocol in place for evaluating Cheatham sites at the SI stage. That's fine, assuming that all partners agree with the established decision tree. However, it seems that when sites fail the screening, the Navy introduces additional (and not necessarily scientifically-sound) screening parameters to justify NFA. I understand that no one wants to unnecessarily propel sites into an RI, but we also can't allow sites that pose potentially significant risks to slip through the cracks. Further, if data gaps exist, they need to be filled (perhaps through an Extended SI) before a final conclusion can be drawn. Bottom line, risk

management calls should primarily be reserved for situations where a site is well characterized and informed decisions can be made.

Response to New EPA Tox General Comment (1/3/12): From the start of this project, the CAX Partnering Team has discussed and agreed upon the course of action for investigating these AOCs. Along the way, there have been three different Navy RPMs and three different EPA RPMs. It's possible successors did not have a clear understanding of past decisions, but the Navy has not acted as a sole decision agent. This SI evaluates five AOCs, which includes two subareas for one AOC (AOC 1) and four subareas for another (AOC 6). In total, eight areas are evaluated. Of these eight, only two have an NFA recommendation – AOC 2 (groundwater portion only) and AOC 6 1918 Drum Storage subarea (soil and groundwater). We feel sufficient data and scientifically-sound reasons for NFA do exist. In addition, at the November 2011 Partnering meeting, the Team discussed and agreed to conducting a risk assessment using existing data to demonstrate that NFA is appropriate; if there is a data gap, it will be presented and resolved. The SI recommendations are appropriate, and the details of the follow-on work can be ironed out later.

TABLE ES-1
Summary of Conclusions and Recommendations
Site Inspection Report: CAX AOCs 1, 2, 6, 7, and 8
Cheatham Annex, Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of 3-step Decision Analysis	Recommendations
AOC 1	Scrap Metal Dump	Unpermitted disposal area reportedly used for the disposal of scrap metal, some debris dating back to the WWI era. During 1998 site visits, two corroded, empty cylinders were observed, labeled "The Liquid Carbonic Co" (cylinders were removed from AOC 1 in April 2000).	Surficial and buried debris within two ravines denoted as AOC 1 North and AOC 1 South in this Site Inspection (SI) Report	Leaching of constituents from surficial and buried debris into soil and groundwater	11 surface soil, 10 subsurface soil, and 3 groundwater samples were collected from AOC 1 North, and 8 surface soil, 8 subsurface soil, and 4 groundwater samples were collected from AOC 1 South	The data suggest the extent of debris has been sufficiently characterized at AOC 1. Exposure to PAHs and zinc in surface soil and inorganics in groundwater may result in potential unacceptable risk to human health and the environment at AOC 1 North. Exposure to PAH's and inorganics in surface soil and inorganics in subsurface soil and groundwater may result in potential unacceptable risk to human health and the environment at AOC 1 South. Additional soil samples at AOC 1 will need to be collected to further characterize the extent of PAH and inorganic contamination in localized "hot spot" areas, as well as collection of surface water and sediment samples at AOC 1 South to determine if PAHs and inorganics have impacted these media. In addition, additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) at AOC 1 to further characterize the extent of PAHs and inorganics in soil within localized "hot spot" areas, as well as to determine if PAHs and inorganics have impacted surface water and sediment at AOC 1 South. In addition, permanent monitoring wells are recommended to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.
AOC 2	Dextrose Dump	Unpermitted disposal area containing foundation piers associated with the former Penniman Shell Loading Plant (PSLP) Shipping House. Buried dextrose bottles, respirator cartridges, several unlabeled, empty 55-gallon drums, and military clothing present.	Surficial and buried debris including drums, respirator cartridges, and dextrose bottles	Leaching of constituents from surficial and buried debris into soil and groundwater	10 surface soil, 18 subsurface soil, and 4 groundwater samples were collected from AOC 2 during historical investigations	The data suggest the extent of debris and groundwater contamination have been sufficiently characterized at AOC 2. Exposure to 4,4'-DDT, mercury, and iron in surface soil, and mercury in subsurface soil, may result in potential unacceptable risks to the environment (potential ecological receptors). Thallium exceeded human heath screening criteria in one subsurface sample location; however, this location is within the proposed removal action Area 2. Additional soil samples will need to be collected to further characterize the extent of mercury in surface and subsurface soil.	Conduct an Interim Removal Action to remove debris in Area 2. In addition, collect surface and subsurface soil samples and analyze for hexavalent chromium to determine if the removal action should include arsenic and chromium "hot spots" (if chromium is in the trivalent form, neither chromium nor arsenic would be HH COPCs). Also, collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots." Lastly, collect surface soil samples and analyzed for pH to determine if iron does pose a potential ecological risk. NFA for groundwater.
AOC 6	1918 Drum Storage Subarea	This subarea was formerly used for the storage of wooden barrels and 55-gallon drums when the shell loading facility was active; however, documentation regarding the contents of these barrels and drums is unknown.	Wooden barrels and/or 55-gallon drums, formerly stored at this subarea	Discharge to ground surface; leaching from soil into groundwater; surface runoff into Penniman Lake	6 co-located surface and subsurface soil samples, and 3 groundwater samples were collected from this subarea	The data suggest the extent of soil and groundwater contamination have been characterized within the 1918 Drum Storage Subarea. Exposure to surface soil, subsurface soil, and groundwater does not pose any potential unacceptable risk to human health or the environment above background conditions and no additional sampling is required.	NFA for all media (soil and groundwater).
	Ammonia Settling Pits Subarea	This subarea is comprised of three buildings associated with the former PSLP; ammonia settling occurred in Building 123, ammonia evaporating occurred in Building 124, and ammonia finishing occurred in Building 125. Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in these buildings is unknown.	Operations formerly conducted in this subarea	Discharge to ground surface; leaching from soil into groundwater; surface runoff into Penniman Lake	5 co-located surface and subsurface soil samples and 3 groundwater samples were collected from this subarea. 1 co-located surface water and sediment samples were collected from Penniman Lake, adjacent to this subarea.	The data suggest the extent of soil, surface water, and sediment contamination have been characterized within the Ammonia Settling Pits Subarea. Exposure to inorganics in groundwater may result in potential unacceptable risk to human health and the environment. Additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) to install permanent monitoring wells to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction. Since no potential unacceptable risk were identified for exposure to surface water and sediment, no additional sampling of Penniman Lake will be conducted.
	TNT Graining House Sump and Catch Box Ruins Subarea	The TNT Graining House Sump and Catch Box Ruins were formerly used as a sump and for settling out TNT particles from wastewater associated with the TNT Graining House (Building 121). Documentation listing the specific details of these processes as well as the date(s) these processes were conducted in Building 121 is unknown.	Operations formerly conducted in this subarea	Discharge to ground surface; leaching from soil into groundwater; surface runoff into Penniman Lake	7 co-located surface and subsurface soil samples and 4 groundwater samples were collected from this subarea. 1 co-located surface water and sediment samples were collected from Penniman Lake, adjacent to this subarea	The data suggest the extent of surface water and sediment contamination have been sufficiently characterized within the TNT Graining House Sump and TNT Catch Box Ruins Subaeras. Exposure to SVOCs, explosives, and inorganics in soil, and inorganics in groundwater, may result in potential unacceptable risks to human health and the environment. Since the extent of SVOCs, explosives and inorganic contamination in soil and inorganic contamination in groundwater have not been sufficiently characterized, additional samples will need to be collected to characterize the nature and extent of SVOCs, explosives, and inorganics in these media.	Conduct an RI to characterize the nature and extent of contamination within soil (SVOCs, explosives and inorganics) and groundwater (inorganics - total and dissolved) and to quantify the risk associated with these media. Since no potential unacceptable risk was identified for exposure to surface water and sediment, sampling of Penniman Lake as part of the RI will not be conducted.
AOC 7	Drum Disposal and Can Pit Areas	Two unlined, nonpermitted disposal areas whose date(s) of debris disposal is unknown. Debris identified within the former Drum Disposal Area included empty 55-gallon drums, while debris identified within the Can Pit included amber glass Clorox bottles and 4-inch tall clear bottles buried below the 5-gallon rusted cans. The can labeling contained the word "tetrachloroethane."	A former surficial 55-gallon drum and buried 5-gallon cans	Discharge to the ground surface from the former 55-gallon drum and 5-gallon cans to ground surface; leaching from soil to groundwater	10 test pits were installed to determine the vertical and horizontal extent of debris; 7 co-located surface and subsurface soil samples and 4 groundwater samples were collected	The data suggest the extent of debris has been sufficiently characterized at AOC 7. Exposure to lead, manganese, and zinc in surface soil may result in potential risks to the environment (ecological receptors) and exposure to ethylbenzene and inorganics in groundwater may result in potential unacceptable risks to human health at AOC 7. Additional groundwater data is needed to confirm the results of elevated inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction.	Conduct an Expanded Site Inspection (ESI) to install permanent monitoring wells to confirm the results of elevated ethylbenzene and inorganic constituent concentrations (in particular upgradient of the site) and verify the groundwater flow direction. In addition, conduct an Interim Removal Action to remove buried debris and to mitigate surface soil inorganic contamination in the Can Pit and to mitigate surface soil inorganic contamination at a localized hot spot within the former Drum Disposal Area.

TABLE ES-1
Summary of Conclusions and Recommendations
Site Inspection Report: CAX AOCs 1, 2, 6, 7, and 8
Cheatham Annex, Williamsburg, Virginia

Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of 3-step Decision Analysis	Recommendations
AOC 8	Unnamed AOC south of Site 7	An unlined, nonpermitted disposal area whose date(s) of debris disposal are unknown. Debris identified at AOC 8 during the SI includes wood, concrete, glass, plexiglass, various metal debris (wire, piping, fencing, bars, rods, chains), construction debris (bricks, burned and unburned wood, nails, burlap, plexiglass shards), a chalky, blue powder, steel cylinders, a metal container, and cable.	Surficial and buried debris	Leaching of constituents from surficial and buried debris into soil and groundwater	26 test pits were installed to determine the vertical and horizontal extent of debris; 9 co-located surface and shallow subsurface soil samples and 4 groundwater samples were collected throughout the site; 3 deep subsurface soil samples were collected from the 3 test pits with the most extensive debris	The data suggest the extent of buried debris, soil and groundwater have not sufficiently been characterized at AOC 8. Exposure to surface and buried debris, benzo(b)fluoranthene and Aroclor-1260 in soil and PCE in groundwater may result in potential unacceptable risks to human health. Since the extent of buried debris has not been characterized, additional test pitting activities are needed to characterize its extent. In addition, additional samples will need to be collected to characterize the nature and extent of benzo(b)fluoranthene and Aroclor-1260 in soil and additional samples will need to be collected to characterize the nature and extent of PCE and arsenic in groundwater.	Conduct an RI to characterize the nature and extent of contamination within soil (PAHs, PCBs, and inorganics) and groundwater (VOCs and inorganics - total and dissolved), quantify the risks associated with these media, and verify groundwater flow direction. Additional test pitting is recommended to determine the horizontal extent of buried debris at AOC 8 (due to the depth of debris, vertical delineation may not be possible) and to verify the presence/absence of buried debris outside the bermed area. Since the extent of the southern area of buried debris was not delineated, collection of additional soil samples is recommended in this area.

TABLE 3-7
AOC 1 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a	Step 2b	Step 3
	Site Potentially CERCLA-eligible?	**Inorganics Above Background or Non-inorganics Detected?**	**Potentially Attributable to CERCLA Release?**	**Exceedances of Comparison Criteria?**	**Results of Qualitative Risk Evaluation Using More Realistic Assumptions**	**Is Further Investigation or Action Required?**
AOC 1 North Surface Soil	Yes	VOCs	Yes	No	N/A	Yes - an Expanded SI for AOC 1 North is recommended to further verify and characterize the extent of SVOC (PAH) and inorganic contamination in the localized surface soil "hot spot" areas. Specifically: 1. Collect surface soil and analyze for SVOCs (PAHs), inorganics, and hexavalent chromium. 2. Install permanent monitoring wells, collect groundwater, and analyze for total and dissolved inorganics. Additionally, verify the groundwater flow direction. Note: No further investigation of subsurface soil is recommended.
		SVOCs	Yes	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only). Also, benzaldehyde was identified as an initial eco COPC since it did not have an available screening value.	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only)	
		Pesticides	Yes	Yes - 2 pesticides (endrin, endrin aldehyde - potential eco risks only)	No (concentrations below 50 ppb)	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 10 inorganics (Al, As, Mn [potential HH and eco risks]; Cr, V [potential HH risks]; CN, Pb, Hg, Zn [potential eco risks])	Yes - Zn (potential eco risk)	
AOC 1 North Subsurface Soil	Yes	VOCs	Yes	No; however, 2-butanone was identified as an initial eco COPC since no screening value was available	N/A	
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	No	N/A	
		Explosives	No (no detections)	No	N/A	
		Inorganics	Yes	Yes - 3 inorganics (Al [potential HH and eco risks]; As, Co [potential HH risks])	No, based on results of HH and eco risk screenings	
AOC 1 North Groundwater	Yes	VOCs	Yes	No	N/A	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 13 total inorganics (Al, Fe, Mn, As, Ba, Be, Cr, Co, Cu, Pb, Ni, Se, V [potential HH risks]) and 3 dissolved inorganics (Al, Fe, Mn [potential eco risks])	Yes - 12 total inorganics (Al, As, Ba, Be, Cr, Co, Cu, Fe, Pb, Mn, Se, V - potential HH risks only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 3-7
AOC 1 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1: Site Potentially CERCLA-eligible?	Step 1: Inorganics Above Background or Non-inorganics Detected?	Step 1: Potentially Attributable to CERCLA Release?	Step 2a: Exceedances of Comparison Criteria?	Step 2b: Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3: Is Further Investigation or Action Required?
AOC 1 South Surface Soil	Yes	VOCs	Yes	No; however, 2 VOCs (2-butanone, acetone) were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	Yes - an Expanded SI of AOC 1 South is recommended to further verify and characterize the extent of SVOC (PAH) and inorganic contamination in the localized surface and subsurface "hot spot" areas. Specifically: 1. Collect surface and subsurface soil and analyze for SVOCs (PAHs) and inorganics. Include hexavalent chromium as part of the surface soil analyses. 2. Install permanent monitoring wells, collect groundwater, and analyze for total and dissolved inorganics. Additionally, verify the groundwater flow direction. 3. Collect surface water and sediment and analyze for SVOCs (PAHs) and inorganics to determine if there has been an impact to these media.
		SVOCs	Yes	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only). Also, carbazole was identified as an initial eco COPC since it did not have an available screening value.	Yes - 5 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, ideno(1,2,3-cd)pyrene - potential HH risks only)	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (As, Mn [potential HH and eco risks]; Al, Cr, Fe [potential HH risks]; Cu, Pb, Hg, Zn [potential eco risks])	Yes - 3 inorganics (Pb, Mn, Zn - potential eco risks only)	
AOC 1 South Subsurface Soil	Yes	VOCs	Yes	No; however, 3 VOCs (2-butanone, carbon disulfide, acetone) were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	
		SVOCs	Yes	Yes - 3 SVOCs (benzo(a)pyrene, benzo(b)fluoranthene,ideno(1,2,3-cd)pyrene - potential HH risks only)	No, based on results of HH risk screening	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (Fe, Pb, Mn [potential HH and eco risks]; Al, Sb, As, Co [potential HH risks]; Cu, Zn [potential eco risks])	Yes - 3 inorganics (Sb, Pb - potential HH risks only; Zn potential eco risk only)	
AOC 1 South Groundwater	Yes	VOCs	Yes	No	N/A	
		SVOCs	Yes	No	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 7 total inorganics (Al, Fe, Pb, Mn, As, Cr, V [potential HH risks]) and 5 dissolved inorganics (Al, Ba, Fe, Pb, Mn [potential eco risks])	Yes - 7 total inorganics (Al, As, Cr, Fe, Pb, Mn, V - potential HH risks) and 1 dissolved inorganic (Fe - potential eco risk)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 4-4
AOC 2 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1			Step 2a	Step 2b	Step 3
	Site Potentially CERCLA-eligible?	**Inorganics Above Background or Non-inorganics Detected?**	**Potentially Attributable to CERCLA Release?**	**Exceedances of Comparison Criteria?**	**Results of Qualitative Risk Evaluation Using More Realistic Assumptions**	**Is Further Investigation or Action Required?**
AOC 2 Surface Soil	Yes	VOCs	No (no detections)	N/A	N/A	Yes - conduct an interim removal action to remove the Area 2 waste (drums and respiratory cartridges) and collect post removal soil samples. Collect surface and subsurface soil samples and analyze for hexavalent chromium to determine if the removal action should include arsenic and chromium "hot spots" (if chromium is in the trivalent form, neither chromium nor arsenic would be HH COPCs). Collect surface and subsurface soil samples and analyze for mercury to determine if the concentrations are background or a laboratory artifact and if the removal action should include mercury "hot spots." Collect surface soil samples and analyzed for pH to determine if iron does pose a potential ecological risk. NFA for groundwater. Note: The one exceeding detection of 4,4'-DDT in surface soil and the HH COPCs in surface and subsurface soil, except for arsenic and chromium, are located in Area 2, where the proposed removal action will be conducted.
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	Yes	Yes - 2 pesticides (4,4'-DDE and 4,4'-DDT - potential eco risks only)	Yes - 4,4'-DDT (potential eco risk only)	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 6 inorganics (As [potential HH and eco risks]; Cr, Fe, V [potential HH risks]; Hg, Se [potential eco risks]). Also, Fe was identified as an initial eco COPC since no pH data was available	Yes - 1 inorganic (Hg - potential eco risk only). Additionally, Fe was retained as an eco COPC since pH data was not available.	
AOC 2 Subsurface Soil	Yes	VOCs	No	N/A	N/A	
		SVOCs	No	N/A	N/A	
		Pesticides	Yes	Yes - 1 pesticide (4,4'-DDE - potential eco risk only)	No, based on eco risk screening	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Yes - 11 inorganics (As, Fe [potential HH and eco risks]; Al, Cd, Cr, Co, Cu, Th, V [potential HH risks]; Hg, Se [potential eco risk])	Yes - 2 inorganics (Hg - potential eco risk only; Th - potential HH risk only)	
AOC 2 Groundwater	Yes	VOCs	No	N/A	N/A	
		SVOCs	No	N/A	N/A	
		Pesticides	No	N/A	N/A	
		PCBs	No	N/A	N/A	
		Explosives	No	N/A	N/A	
		Inorganics	Yes	Yes - 12 total inorganics (Al, As, Be, Cd, Cr, Co, Fe, Pb, Mn, Ni, Th, V - potential HH risks only)	No - 2 total inorganics (As and Mn) exceed the HH risk value, but can risk manage	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 5-12
AOC 6 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1 Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Backgroun or Non-inorganics Detected?	Step 1 Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Usin More Realistic Assumption	Step 3 Is Further Investigation or Action Required?
AOC 6 - 1918 Drum Storage Area Surface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	No
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 2 inorganics (Al [potential HH and eco risks]; Pb [potential eco risk])	No, based on results of HH and eco risk screenings	
AOC 6 - 1918 Drum Storage Area Subsurface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 2 inorganic (Al, Th - potential HH risks only)	No, based on results of HH risk screening	
AOC 6 - 1918 Drum Storage Area Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 12 total inorganics (Al, As, Be, Cd, Cr, Co, Fe, Pb, Mn, Ni, Th, V - potential HH risks) and 1 dissolved inorganic (Al - potential eco risk))	No, based on the results of the HH and eco risk screenings	
AOC 6 - Ammonia Settling Pits Surface Soil	Yes	SVOCs	Yes	Yes - 3 SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene - potential HH risks only)	No, based on results of HH risk screening	Yes - An ESI is recommended to install permanent monitoring wells and confirm potential groundwater inorganic constituent contamination and and verify the groundwater flow direction.
		Explosives	Yes	Yes - 1 explosive (HMX - potential eco risk only). Also, 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were identified as initial eco COPCs since no screening values were available	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 1 inorganic (Hg - potential eco risk only)	No, based on results of eco risk screening	
AOC 6 - Ammonia Settling Pits Subsurface Soil	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	Yes	No; however, 1,3,5-trinitrobenzene was identified as an initial eco COPC since no screening value was available	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 1 inorganic (Al - potential HH and eco risk)	No, based on results of HH and eco risk screenings	
AOC 6 - Ammonia Settling Pits Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 8 total inorganics (Al, As, Cr, Co, Fe, Pb, Mn, V - potential HH risks) and 3 dissolved inorganics (Co, Fe, Mn - potential eco risks)	Yes - 6 total inorganics (Al, As, Cr, Co, Fe, Mn - potential HH risks) an 2 dissolved inorganics (Fe, Mn - potential eco risks)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 5-12
AOC 6 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Backgroun or Non-inorganics Detected?	Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Usin More Realistic Assumption	Step 3 Is Further Investigation or Action Required?
AOC 6 - TNT Graining House Sump and Catch Box Ruins Surface Soil	Yes	SVOCs	Yes	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only).	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only)	Yes - An RI is recommended to characterize the nature and extent of contamination and conduct quantitative risk assessments. Permanent monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for SVOCs, explosives and inorganics, plus include hexavalent chromium as part of the surface soil analyses. It is recommended groundwater samples are analyzed for inorganics (total and dissolved).
		Explosives	Yes	Yes - 6 explosives (1,3-dinitrobenzene, 2-amino-4,6-dinitrotoluene, 2-nitrotoluene, 3,5-dinitroaniline, 4-amino-2,6-dinitrotoluene [potential HH risks]; 2,4,6-trinitrotoluene [potential HH and eco risks]). Also, 1,3-dinitrobenzene, 1,3,5-trinitrobenzene, 2-nitrotoluene, and 3,5-dinitroaniline were identified as initial eco COPCs since no screening values were available	Yes - 2 explosives (2,4,6-trinitrotoluene, 2-nitrotoluene - potential HH and eco risks)	
		Inorganics	Yes	Yes - 10 inorganics (Al, Fe, Pb [potential HH and eco risks]; As, Cr, Th, V [potential HH risks]; Hg, Se, Zn [potential eco risks]	Yes - 3 inorganics (As, Cr - potential HH risks only; Se - potential eco risk only)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Subsurface Soil	Yes	SVOCs	Yes	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH and eco risks)	Yes - 1 SVOC (2,4-dinitrotoluene - potential HH risk only)	
		Explosives	Yes	Yes - 3 explosives (1,3-dinitrobenzene, 4-amino-2,6-dinitrotoluene [potential HH risk only]; 2,4,6-trinitrotoluene [potential HH and eco risks]) Also, 1,3-dinitrobenzene and 3,5-dinitroaniline were identified as initial eco COPCs since no screening values were available	Yes - 1 explosive (2,4,6-trinitrotoluene - potential HH and eco risks)	
		Inorganics	Yes	Yes - 6 inorganics (Al, As [potential HH and eco risks]; Cr, Fe, V [potential HH risk only]; Se [potential eco risk only])	Yes - 3 inorganics (As, Cr - potential HH risk only; Se - potential eco risk only)	
AOC 6 - TNT Graining House Sump and Catch Box Ruins Groundwater	Yes	SVOCs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 total inorganics (Al, As, Be, Cr, Co, Fr, Pb, Mn, V [potential HH risks]) and 7 dissolved inorganics (Al, Cr, Cu, Fe, Pb, Mn, Ag [potential eco risks])	Yes - 9 total inorganics (Al, As, Be, Cr, Co, Fr, Pb, Mn, V - potential HH risks) and 2 dissolved inorganics (Al, Fe - potential eco risks)	
Penniman Lake Surface Water Adjacent to AOC 6	Yes	SVOCs	Yes	No; however, di-n-octylphthalate was identified as an initial HH COPC since no screening value was available	No, based on results of HH risk screening	No
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 1 inorganic (Ba - potential eco risk only)	No, based on results of eco risk screening	
Penniman Lake Sediment Adjacent to AOC 6	Yes	SVOCs	Yes	Yes - 1 SVOC (2,6-dinitrotoluene - potential eco risk only). Also, di-n-octylphthalate was identified as an initial HH COP since no screening value was available	No, based on results of HH and eco risk screenings	No
		Explosives	Yes	Yes - 1 explosive (4-amino-2,6-dinitrotoluene - potential eco risk only)	No, based on results of eco risk screening	
		Inorganics	Yes	Yes - 2 inorganics (As [potential HH and eco risks]; Cr [potential HH risk]). Also, Be was identified as an initial eco COPC since no screening value was available	No, based on results of eco risk screening	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 6-4
AOC 7 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Site Potentially CERCLA-eligible?	Step 1 Inorganics Above Background or Non-inorganics Detected?	Step 1 Potentially Attributable to CERCLA Release?	Step 2a Exceedances of Comparison Criteria?	Step 2b Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3 Is Further Investigation or Action Required?
AOC 7 Surface Soil	Yes	VOCs	No (no detections)	N/A	N/A	Yes - An interim removal action is recommended to remove buried debris and mitigate surface soil inorganic contamination in the Can Pit and to mitigate inorganic contamination at a localized "hot spot" within the former Drum Disposal Area surface soil. Post removal samples should be collected and analyzed for inorganics. An expanded SI for groundwater is recommended to verify groundwater flow direction and to verify and characterize the extent of ethylbenzene (VOC) and inorganic contamination. Permanent monitoring wells are recommended. Note: The removal action would mitigate the potential unacceptable HH risk associated with As, Cr, and Fe in surface soil that was identified in Step 2a and eliminated in Step 2b.
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 9 inorganics (As, Cr, Pb, Mn [potential HH and eco risks]; Al, Co, Fe [potential HH risks]; Cu, Zn [potential eco risks])	Yes - 3 inorganics (Pb, Mn, Zn - potential eco risks only).	
AOC 7 Subsurface Soil	Yes	VOCs	Yes	No; however, 2-butanone was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
		SVOCs	Yes	No	N/A	
		Pesticides	Yes	No	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	Yes	No; however, nitroguanidine was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
		Inorganics	Yes	Yes - 6 inorganics (Al, Mn [potential HH and eco risks]; As [potential HH risk]; Pb, Se, Zn [potential eco risks])	No, based on HH and eco risk screenings	
AOC 7 Groundwater	Yes	VOC	Yes	Yes - 1 VOC (ethylbenzene - potential HH risk only)	Yes - 1 VOC (ethylbenzene - potential HH risk only)	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics (total)	Yes	Yes - 9 total inorganics (Al, As, Cr, Fe, Pb, Mn, Ni, Se, V - potential HH risks) and 3 dissolved inorganics (Al, Fe, Ag - potential eco risks)	Yes - 7 total inorganics (Al, As, Cr, Fe, Pb, Mn, V - potential HH risks only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

TABLE 7-4
AOC 8 Decision Summary
Site Inspection Report: Areas of Concern 1, 2, 6, 7 and 8
Cheatham Annex
Williamsburg, Virginia

Medium	Step 1: Site Potentially CERCLA-eligible?	Step 1: Inorganics Above Background or Non-inorganics Detected?	Step 1: Potentially Attributable to CERCLA Release?	Step 2a: Exceedances of Comparison Criteria?	Step 2b: Results of Qualitative Risk Evaluation Using More Realistic Assumptions	Step 3: Is Further Investigation or Action Required?
AOC 8 Surface Soil	Yes	VOCs	Yes	No; however, 1 VOC (acetone) was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	Yes - an RI is recommended to characterize the nature and extent of contamination within soil and groundwater and quantify the associated risk. Monitoring wells are recommended to verify the groundwater flow direction and to confirm the results of the DPT groundwater samples at the site. It is recommended soil samples are analyzed for PAHs, PCBs, and inorganics, plus include hexavalent chromium as part of the surface soil analyses. It is recommended groundwater samples are analyzed for VOCs and inorganics (total and dissolved). Additional test pitting is recommended to verify the presence/absence of buried debris outside the bermed area. Since the extent of the debris was not delineated to the south, additional soil samples are recommended in this area. Since debris was encountered to a depth of 20 feet bgs, additional activities are recommended.
		SVOCs	Yes	Yes - 1 SVOC (benzo(b)fluoranthene - potential HH risk only). Also, benzaldehyde was identified as an initial eco COPC since no screening value was available	Yes - 1 SVOC (benzo(b)fluoranthene - potential HH risk only)	
		Pesticides	Yes	Yes - 1 pesticide (endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 5 inorganics (As, Cr, Th [potential HH risks]; Se, Zn [potential eco risks])	No, based on HH and eco risk screenings	
AOC 8 Subsurface Soil	Yes	VOCs	Yes	No; however, 1 VOC (2-butanone) was identified as an initial eco COPC since no screening value was available	No, based on eco risk screening	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	Yes	Yes - 1 pesticide (endrin aldehyde - potential eco risk only)	No (concentrations below 50 ppb)	
		PCBs	Yes	Yes - 1 PCB (Aroclor-1260 - potential HH risk only)	No, based on HH risk screening	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 1 inorganic (As - potential HH risk only)	No, based on HH risk screening	
AOC 8 Groundwater	Yes	VOCs	Yes	Yes - 1 VOC (tetrachloroethene - potential HH risk only)	Yes - 1 VOC (tetrachloroethene - potential HH risk only)	
		SVOCs	No (no detections)	N/A	N/A	
		Pesticides	No (no detections)	N/A	N/A	
		PCBs	No (no detections)	N/A	N/A	
		Explosives	No (no detections)	N/A	N/A	
		Inorganics	Yes	Yes - 3 total inorganics (As, Fe, Mn - potential HH risks) and 3 dissolved inorganics (Al, Fe, Mn - potential eco risks)	Yes - 1 inorganic (As - potential HH risk only)	

Notes:
N/A - Not applicable
HH - human health
eco - ecological
COPC - constituent of potential concern

6 – USEPA's Comments on the Draft Final SI Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

February 1, 2012

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Comments on the Draft Site Inspection Report: Areas of Concern 1,2,6,7 and 8.

Ms. Parra:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

EPA RPM Comment 1: For AOC 6, I'm assuming this is the barrel pile from the 1918 photographs? Can we transpose the location of the former rail spur (from the 1918 photos) on the figure 5-4? Or just a figure as part of the RTC's would be fine. I'm having a hard time identifying any landmarks to know this is the correct location from what I'm seeing on the 1918 photograph. Also, what is the future anticipated use for this area (are these the cabins?)?

EPA RPM Comment 2: As part of the response to RPM General Comment 2, were all 5 below the low of the range or where did the fall with the range?

EPA RPM Comment 3: For the barium and the explosives issues, please make it clear in the document that these media need to be and will be investigated/assessed in the Penniman Lake RI.

EPA RPM Comment 4: Response to Comment 30. VOCs should be analyzed as part of the confirmation sampling due to the cans being labeled "PCE".

EPA RPM Comment 5: AOC 1 North. The aluminum on the eastern portion of the site should be considered when additional samples are taken (I forget if we added a location here during scoping or not). The hit is exceeds the residential RSL in both the surface and subsurface sample.

EPA RPM Comment 6: AOC 6. Ammonia Settling Pit. Please confirm, as discussed in the meeting, why samples were only taken around the Ammonia Finishing Area.

EPA RPM Comment 7: For AOC 2, is the subsurface DDE within the removal footprint? Looks like it is the same spot you guys say will remove the surface pesticide detect and is only at a depth of 0.5-1'. If so, make this clear in the text. The Arsenic levels are elevated and I'm not sure that it will "fall out" when risk is evaluated.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

7 – Navy's Response to USEPA's Comments on the Draft Final SI Report

Response To Comments

Draft Final Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA

February 24, 2012

Comments received by email on February 1, 2012 from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3 following review of the draft final site inspection (SI) report and revisions to the previous response to comments document submitted January 3, 2012 via email.

EPA RPM Comment 1: *For AOC 6, I'm assuming this is the barrel pile from the 1918 photographs? Can we transpose the location of the former rail spur (from the 1918 photos) on the figure 5-4? Or just a figure as part of the RTC's would be fine. I'm having a hard time identifying any landmarks to know this is the correct location from what I'm seeing on the 1918 photograph. Also, what is the future anticipated use for this area (are these the cabins?)?*

Response:

As requested, the former railroad spur has been added to Figures 5-4 as well as to Figures 5-8, 5-9, and 5-10 (see attached files). This railroad spur is shown on Sample Location Map #2 with the *Final Site Inspection Narrative Report* (Weston, 1999). As documented in the 1999 Final Site Inspection Narrative Report, the location of the 1918 Drum Storage subarea was based upon the 1918 panoramic photographs of the Penniman Shell Loading Plant; the 1918 Drum Storage subarea is located on Photo 7 of 12 within this series of photos.

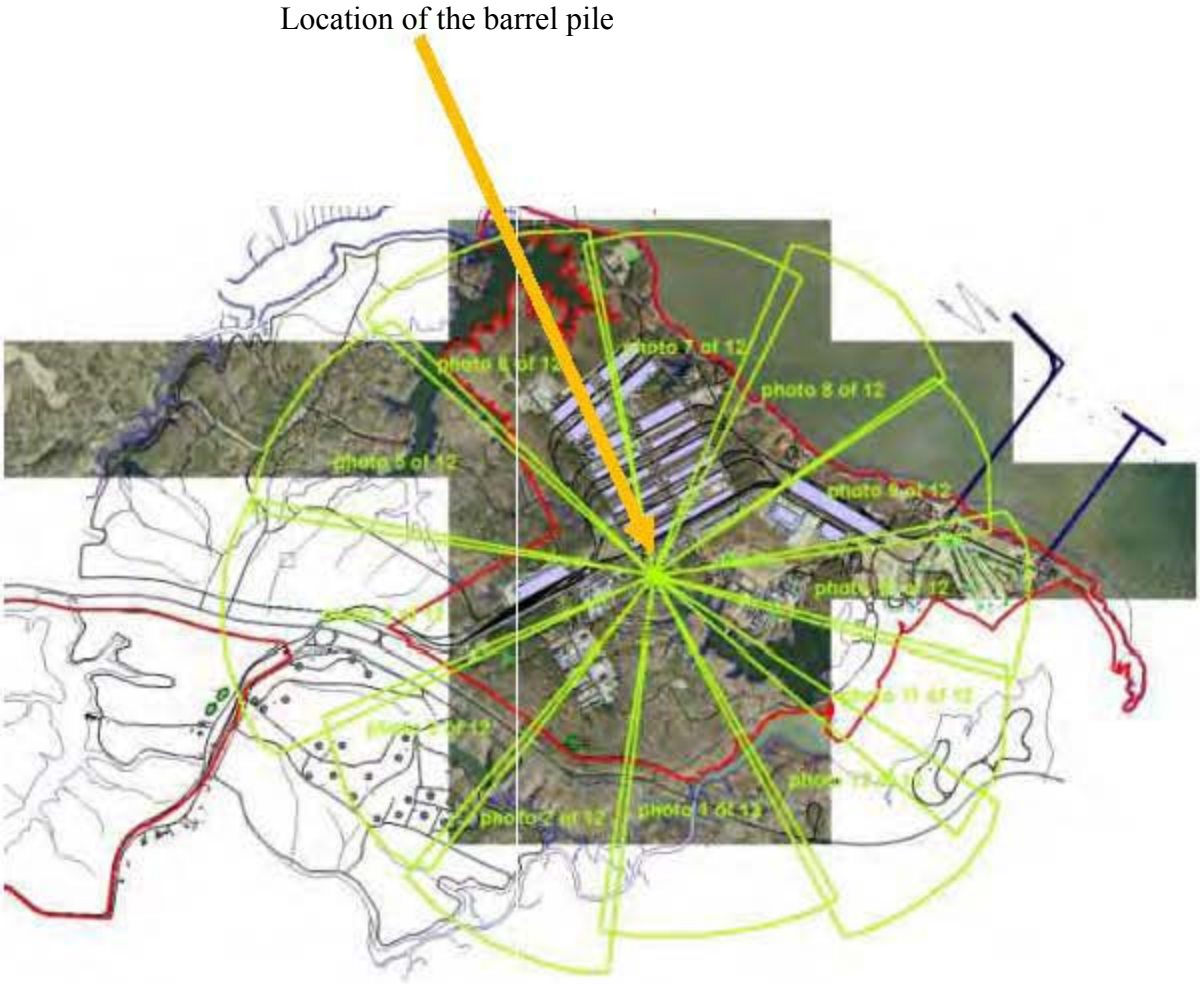
The 1918 Drum Storage subarea includes grassed areas, a paved parking lot, and two office buildings. The future anticipated use for this area is not expected to change and will likely continue as office and parking spaces. No cabins are located within the 1918 Drum Storage subarea.

Descriptions of supporting historical figures and photos are as follows:

Sample Location Map #2 from the *Final Site Inspection Narrative Report* (Weston, 1999)

Location of the 1918 Drum Storage subarea

Orientation of Penniman Panoramic photos (1918 Drum Storage subarea barrel pile is shown in photo 7 of 12)



Penniman Panoramic – Photo 7 of 12

Location of the barrel pile

Penniman Shell Loading Plant, 1918
Panoramic Photograph No. 7 of 12
(building labels derived from engineering drawings)

Prepared by: Roy F. Weston, Inc. for U.S. EPA Region III, October 1998

EPA RPM Comment 2: *As part of the response to RPM General Comment 2, were all 5 [instances where the explosive constituents were screened out by being compared to ecological screening values of other similar explosives] below the low of the range or where did the[y] fall with the range?*

Response: With the exception of 2-nitrotoluene detected in surface soil at the AOC 6 TNT Graining House Sump and Catch Box Ruins subareas, the detections of the explosive constituents were below the range minimum of 2,260 µg/kg. The detection of 2-nitrotoluene (48,000 µg/kg) was slightly above the center of the range of 2,260 to 80,000 µg/kg. Appendix B of the draft final SI was revised to document the five instances where these screening comparisons occurred and are summarized below for convenience:

1. Surface Soil – AOC 6 Ammonia Settling Pits

Compounds 1,3,5-trinitrobenzene and 1,3-dinitrobenzene, which did not have screening values, were detected at maximum concentrations of 2,100 and 100 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg for nitrobenzene and 4-Amino-2,6-dinitrotoluene, respectively. The maximum site concentrations of 1,3,5-trinitrobenzene and 1,3-dinitrobenzene were less than the soil screening values for these other explosives. Thus, these two constituents were not identified as refined COPCs.

2. Surface Soil – AOC 6 TNT Graining House Sump and Catch Box Ruins

- 1,3,5-Trinitrobenzene, 1,3-dinitrobenzene, and 3,5-dinitroaniline, which did not have screening values, were detected at maximum concentrations of 1,100, 730, and 890 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg for nitrobenzene and 4-Amino-2,6-dinitrotoluene, respectively. The maximum site concentrations of 1,3,5-trinitrobenzene, 1,3-dinitrobenzene, and 3,5-dinitroaniline were less than the soil screening values for these other explosives. Thus, these three constituents were not identified as refined COPCs.

- 2-Nitrotoluene, which did not have a screening value, was detected at a maximum concentration of 48,000 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg for nitrobenzene and 4-Amino-2,6-dinitrotoluene, respectively. The maximum site concentration of 2-nitrotoluene exceeded the soil screening values for some of these other explosives. Thus, this constituent was identified as a refined COPC.

3. Subsurface Soil – AOC 6 Ammonia Settling Pits

1,3,5-Trinitrobenzene, which did not have a screening value, was detected at a maximum concentration of 41.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg for nitrobenzene and 4-Amino-2,6-dinitrotoluene, respectively. The maximum site concentration of 1,3,5-trinitrobenzene was less than the soil screening values for these other explosives. Thus, this constituent was not identified as a refined COPC.

4. Subsurface Soil – AOC 6 TNT Graining House Sump and Catch Box Ruins

1,3-Dinitrobenzene and 3,5-dinitroaniline, which did not have screening values, were detected at maximum concentrations of 1,600 and 550 µg/kg, respectively. These maximum concentrations were compared with the range of soil screening values for all other

explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg for nitrobenzene and 4-Amino-2,6-dinitrotoluene, respectively. The maximum site concentrations of 1,3-dinitrobenzene and 3,5-dinitroaniline were less than the soil screening values for these other explosives. Thus, these two constituents were not identified as refined COPCs.

5. Subsurface Soil – AOC 7

Nitroguanidine, which did not have a screening value, was detected at a maximum concentration of 63.0 µg/kg. This maximum concentration was compared with the range of soil screening values for all other explosives (not including perchlorate, which is not technically an explosive) with such values. These values, which are provided in **Appendix B, Table B-1**, ranged from 2,260 to 80,000 µg/kg for nitrobenzene and 4-Amino-2,6-dinitrotoluene, respectively. The maximum site concentration of nitroguanidine was less than the soil screening values for these other explosives. Thus, this constituent was not identified as a refined COPC.

EPA RPM Comment 3: *For the barium and the explosives issues, please make it clear in the document that these media need to be and will be investigated/assessed in the Penniman Lake RI.*

Response: As requested, the text in Section 5.3.3 will be revised as follows:

Penniman Lake Surface Water and Sediment Adjacent to AOC 6

No potential human health or ecological risks were identified in the Penniman Lake surface water and sediment samples. However, since there are potentially unacceptable human health and ecological risks associated with exposure to SVOCs, explosives, and inorganics in soil at the two TNT subareas and with exposure to inorganics in groundwater at the Ammonia Settling Pit subarea, future Penniman Lake samples will include inorganic and explosive analyses, as appropriate and agreed to by the Partnering Team. These samples will be part of an RI for Penniman Lake and will not be collected as part of any AOC 6 follow-on investigations.

EPA RPM Comment 4: *Response to Comment 30. VOCs should be analyzed as part of the confirmation sampling due to the cans being labeled "PCE".*

Response: Noted. The post removal soil sample analyte list is a Partnering Team discussion and agreement will occur during the development of the Engineering Evaluation/Cost Analysis (EE/CA) and no change to the SI is necessary.

EPA RPM Comment 5: *AOC 1 North. The aluminum on the eastern portion of the site should be considered when additional samples are taken (I forget if we added a location here during scoping or not). The hit is exceeds the residential RSL in both the surface and subsurface sample.*

Response: While the surface and subsurface aluminum concentrations in soil at the SI location in question (CAA01-SO06) exceeded the residential RSL, please note that aluminum was not retained as a COPC in either media. Aluminum did not contribute to the cumulative cancer risk for surface soil and its HI value (0.2) did not exceed the cumulative target organ HI risk-ration

screening benchmark of 0.5. Likewise, in the subsurface soil, the cumulative cancer risk ($2x10^{-5}$) was less than the $5x10^{-5}$ risk-ratio screening benchmark and the HI value for aluminum (0.2) was less than the 0.5 benchmark. However, a "hot spot" in the northeast portion of the site has been identified and samples will be collected and analyzed for inorganics (and PAHs) [see attached figure from the January 2012 ESI scoping session and note that no changes to this figure occurred during the session (sample location changes were made to AOC 1 South only)].

Also, note that the ESI for AOC 1 North will include surface soil sampling only and no subsurface soil sampling, as there were no COPCs indentified in the subsurface soil.

EPA RPM Comment 6: *AOC 6. Ammonia Settling Pit. Please confirm, as discussed in the meeting, why samples were only taken around the Ammonia Finishing Area.*

Response: According to the Weston Reports, it was believed that ammonia from the ammonia finishing building was discharged through the settling pits (located north of the building) prior to being discharged to Penniman Lake. During the development of the 2008 SI Work Plan, based on the location of the ammonia evaporating area, it was assumed that groundwater most likely radiated in several directions towards Penniman Lake; however based on field observations of the topography, it is more likely that the greatest concentration of contaminants from the ammonia evaporating area would have been directly east-northeast and north. Therefore, the SI sample collection concentrated on the vicinity of the Ammonia Finishing Area.

EPA RPM Comment 7: *For AOC 2, is the subsurface DDE within the removal footprint? Looks like it is the same spot you guys say will remove the surface pesticide detect and is only at a depth of 0.5-1'. If so, make this clear in the text. The Arsenic levels are elevated and I'm not sure that it will "fall out" when risk is evaluated.*

Response: Yes, the subsurface DDE hit at sample location CAA02-A2H02 (collected from 6-12" bgs) is within the Area 2 removal footprint. However, this DDE detection was NOT retained as a refined ecological COPC for subsurface soil, because the mean HQ was less than 1.0. Nonetheless, DDT was retained as an eco COPC for surface soil at this same location and the Area 2 removal excavation will be at least a foot deep (or greater depending on the location of the respirator cartridges and drums), so the subsurface DDE location will be removed. The SI will recommend the removal action and post removal sample collection; however, the number, location, and analyte list for these samples will be a Partnering Team discussion and decision during development of the EE/CA for the removal action.

The text change is as follows (Section 4.3.3, paragraph 5):

An interim removal action is recommended to remove the Area 2 debris (respirator cartridges and empty 55-gallon drums). The removal would also address the potential ecological risk associated with 4,4'-DDT in surface soil and the human health COPCs in surface and subsurface soil, except arsenic and chromium, which had exceedances outside of Area 2. Although the subsurface soil DDE detection was NOT retained as a refined ecological COPC,

DDT was retained as an eco COPC for surface soil at this same location. The Area 2 removal excavation will be at least a foot deep (or greater depending on the location of the respirator cartridges and drums), so the subsurface DDE location will be removed as well. Post removal soil samples should be collected; the number, location, and analyte list for these samples will be determined during the development of the EE/CA for the removal action.

Regarding the arsenic levels, based on the results of the human health risk screening for AOC 2 subsurface soil, Aroclor-1260, arsenic, and chromium were identified as COPCs based on carcinogenic risk (cumulative carcinogenic risk above risk screening level of 5x10-5). This risk was primarily associated with chromium (contributed carcinogenic risk of 1x10-4), based on the assumption that all of the total chromium was hexavalent chromium. The contribution of the risk from Aroclor-1260 (carcinogenic risk of 1x10-6) and arsenic (carcinogenic risk of 4x10-5) alone don't exceed the acceptable carcinogenic risk screening level of 5x10-5. Therefore, if the detected chromium is not present as hexavalent chromium, the cumulative carcinogenic risk for the conservative risk screening associated with residential exposure to the subsurface soil would be 4x10-5, which does not exceed the acceptable carcinogenic screening level. However, if the chromium is present in the hexavalent form, there could be an unacceptable risk, mainly associated with hexavalent chromium, but also with a smaller contribution from arsenic. A SAP addendum is being prepared for the collection of surface and subsurface soil samples and analyze them for the inorganic COPCs [mercury (ecological concern) and hexavalent and total chromium (human health concern)] that lie outside of Area 2 (the intended removal area). Depending on the results, the removal action may be extended to include hot spots for these constituents, which would include arsenic if chromium is in the hexavalent form. The SAP addendum scoping session is planned for the March 2012 Partnering meeting.

<u>Hexavalent Chromium Analysis</u>

After the submission of the draft final Multiple AOC SI text and revised RTC letter for EPA review, the CAX Partnering Team discussed the intended hexavalent chromium analysis for follow-on investigations at CAX sites at the January 2012 Partnering Meeting. The Team agreed no groundwater samples will be analyzed for hexavalent chromium unless there is a known source. The Team also agreed five soil samples for hexavalent chromium analysis at each site was not necessary, that the number could be reduced per site and the results from each site would be used to create a basewide number[1]. The table below summarizes the changes in the hexavalent chromium sampling per AOC. The Draft Final SI text (*Step 3 – Is Further Investigation or Action Required*) and Decision Summary Tables for the AOCs will be revised as needed to reflect the "Revised" column. The Navy assumes the table below sufficiently captures

[1] Refer to the January 2012 Partnering Meeting minutes for the detailed discussion.

the changes that will be incorporated and another review of the text and Decision Summary Tables is unnecessary, unless such a review is desired.

Summary of RI/ESI Hexavalent Chromium Analyses per AOC

AOC	Media	Number of Samples[2]	
		Originally Proposed	**Revised**
AOC 1 North	Surface Soil	All samples	2
	Subsurface Soil	None	N/A
	Groundwater	All samples	None
AOC 1 South	Surface Soil	All samples	None
	Subsurface Soil	None	N/A
	Groundwater	All samples	None
AOC 2	Surface Soil	All samples	3
	Subsurface Soil	All samples	3
	Groundwater	None	N/A
AOC 6 – 1918 Drum Storage Subarea	Surface Soil	None	N/A
	Subsurface Soil	None	N/A
	Groundwater	None	N/A
AOC 6 - Ammonia Settling Pits Subarea	Surface Soil	None	N/A
	Subsurface Soil	None	N/A
	Groundwater	All samples	None
AOC 6 –TNT Graining House Sump and TNT Catch Box Ruins Subareas	Surface Soil	All samples	1
	Subsurface Soil	None	2
	Groundwater	All samples	None
AOC 7	Surface Soil	None	N/A
	Subsurface Soil	None	N/A
	Groundwater	None	N/A
AOC 8	Surface Soil	All samples	2
	Subsurface Soil	None	N/A
	Groundwater	None	N/A

[2] The "Originally Proposed" column reflects the recommendations in the draft final document to show what requires revision. The "Revised" column reflects the Team discussion and decision during the January 2012 Partnering Meeting (see minutes for details), except for AOC 2, which was not discussed at the meeting. The "Revised" number for AOC 2 will be the recommendation in the upcoming SAP Addendum. The SI text and Decision Summary Tables will be revised as needed to reflect the "Revised" column.

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-4_AOC 6 1918 DRUM STORAGE.MXD BHATHAWA 2/21/2012 3:50:03 PM

Legend

- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs
- Topographic Surface Contour (feet above mean sea level)

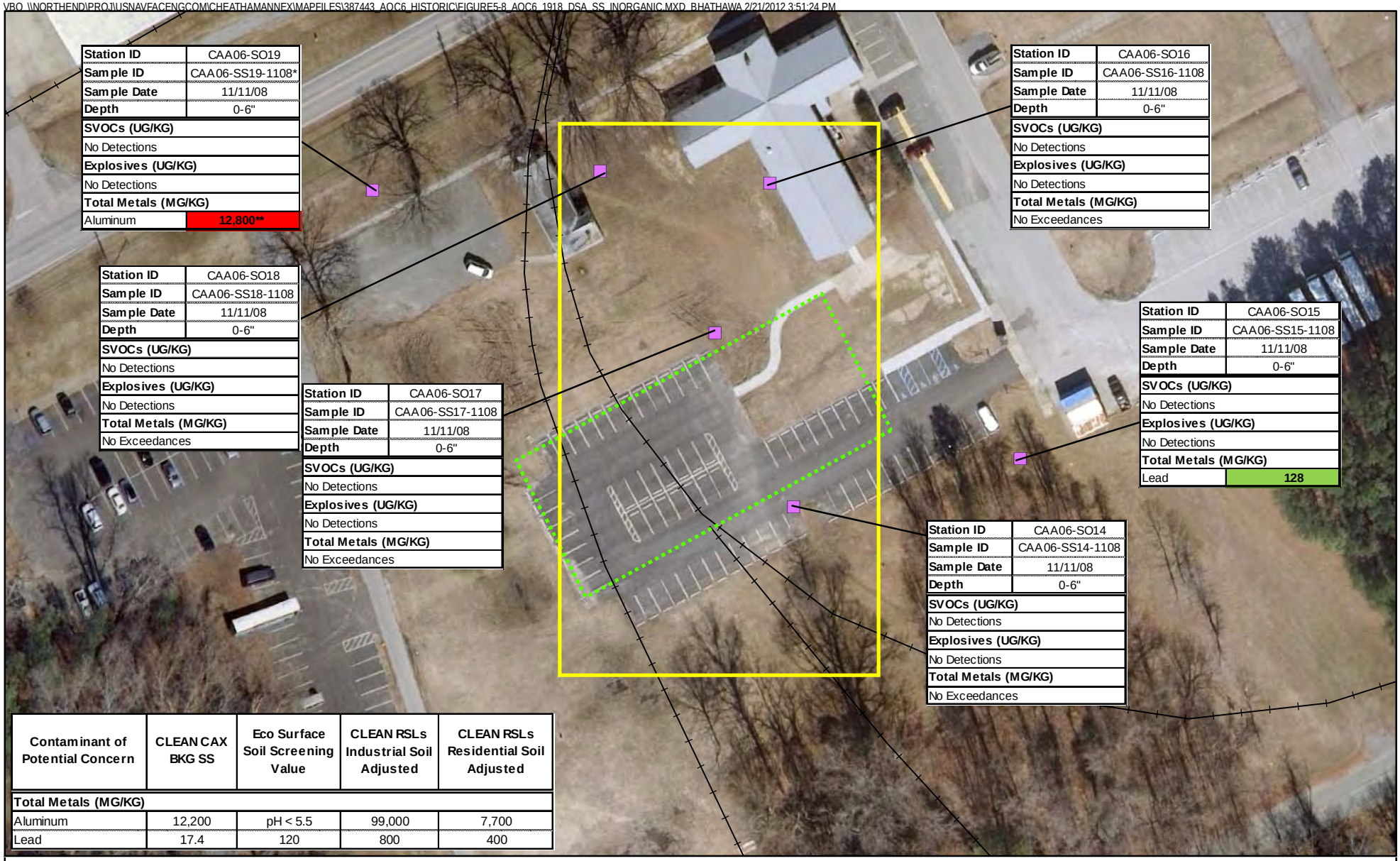
N
W E
S

0 40 80
Feet

Figure 5-4
AOC 6 Site Map; 1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-8_AOC6_1918_DSA_SS_INORGANIC.MXD BHATHAWA 2/21/2012 3:51:24 PM



Station ID	CAA06-SO19
Sample ID	CAA06-SS19-1108*
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
Aluminum	12,800**

Station ID	CAA06-SO16
Sample ID	CAA06-SS16-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO18
Sample ID	CAA06-SS18-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO17
Sample ID	CAA06-SS17-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA06-SO15
Sample ID	CAA06-SS15-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
Lead	128

Station ID	CAA06-SO14
Sample ID	CAA06-SS14-1108
Sample Date	11/11/08
Depth	0-6"
SVOCs (UG/KG)	
No Detections	
Explosives (UG/KG)	
No Detections	
Total Metals (MG/KG)	
No Exceedances	

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted	CLEAN RSLs Residential Soil Adjusted
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Lead	17.4	120	800	400

Legend

- Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs

Notes:

Exceeds BKG & ECO

Exceeds BKG, ECO & Res RSL

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

**Eco exceedance due to pH value

-- - No value available

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

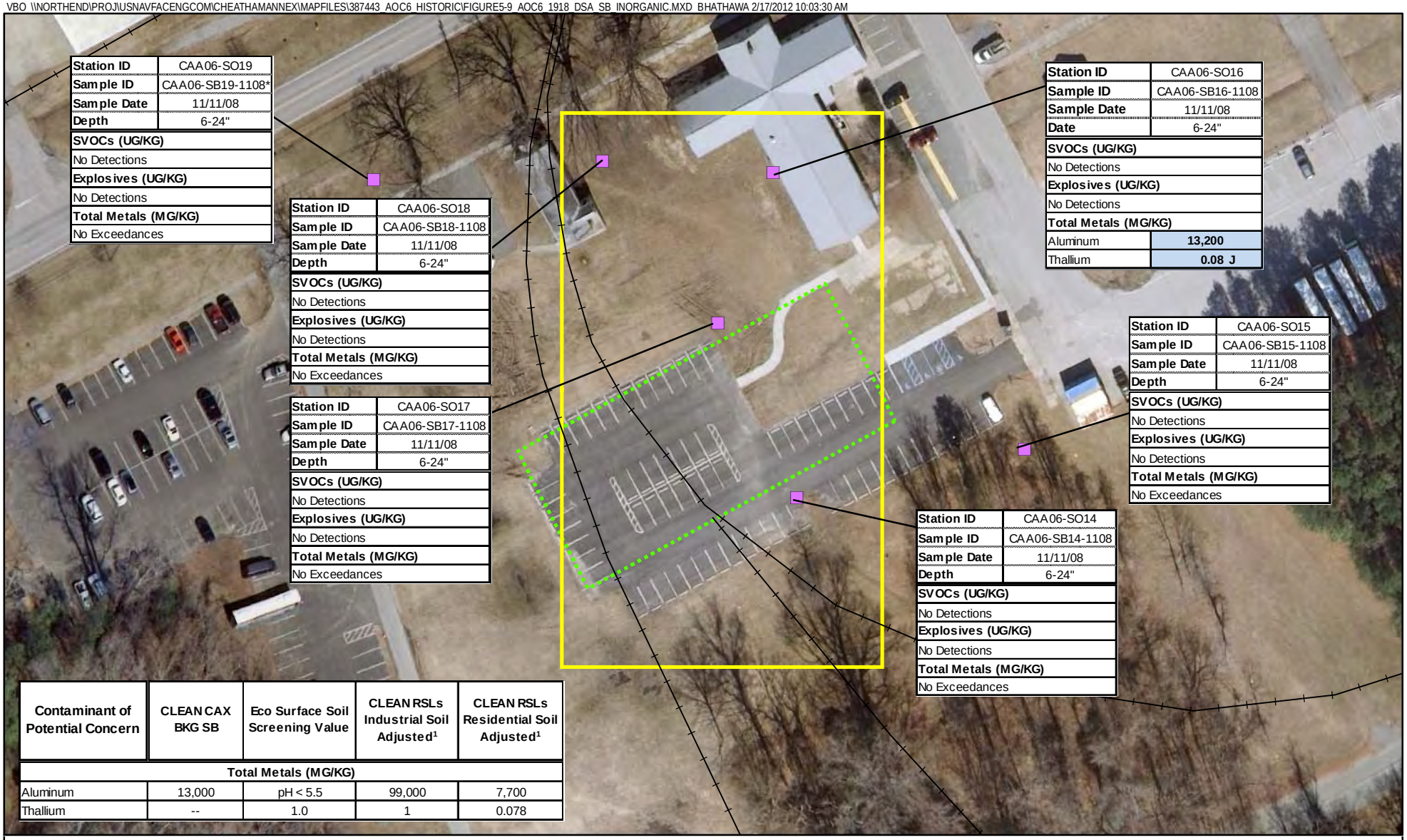
N W E S

0 40 80 Feet

Figure 5-8
AOC 6 Surface Soil Exceedance Results
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-9_AOC6_1918_DSA_SB_INORGANIC.MXD BHATHAWA 2/17/2012 10:03:30 AM



Contaminant of Potential Concern	CLEAN CAX BKG SB	Eco Surface Soil Screening Value	CLEAN RSLs Industrial Soil Adjusted[1]	CLEAN RSLs Residential Soil Adjusted[1]
Total Metals (MG/KG)				
Aluminum	13,000	pH < 5.5	99,000	7,700
Thallium	--	1.0	1	0.078

Legend

- Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs

Notes:

Exceeds BKG and Res RSL

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

[1] Adjusted June 2011 RSL value

-- - No value available

MG/KG - Milligrams per kilogram

UG/KG - Micrograms per kilogram

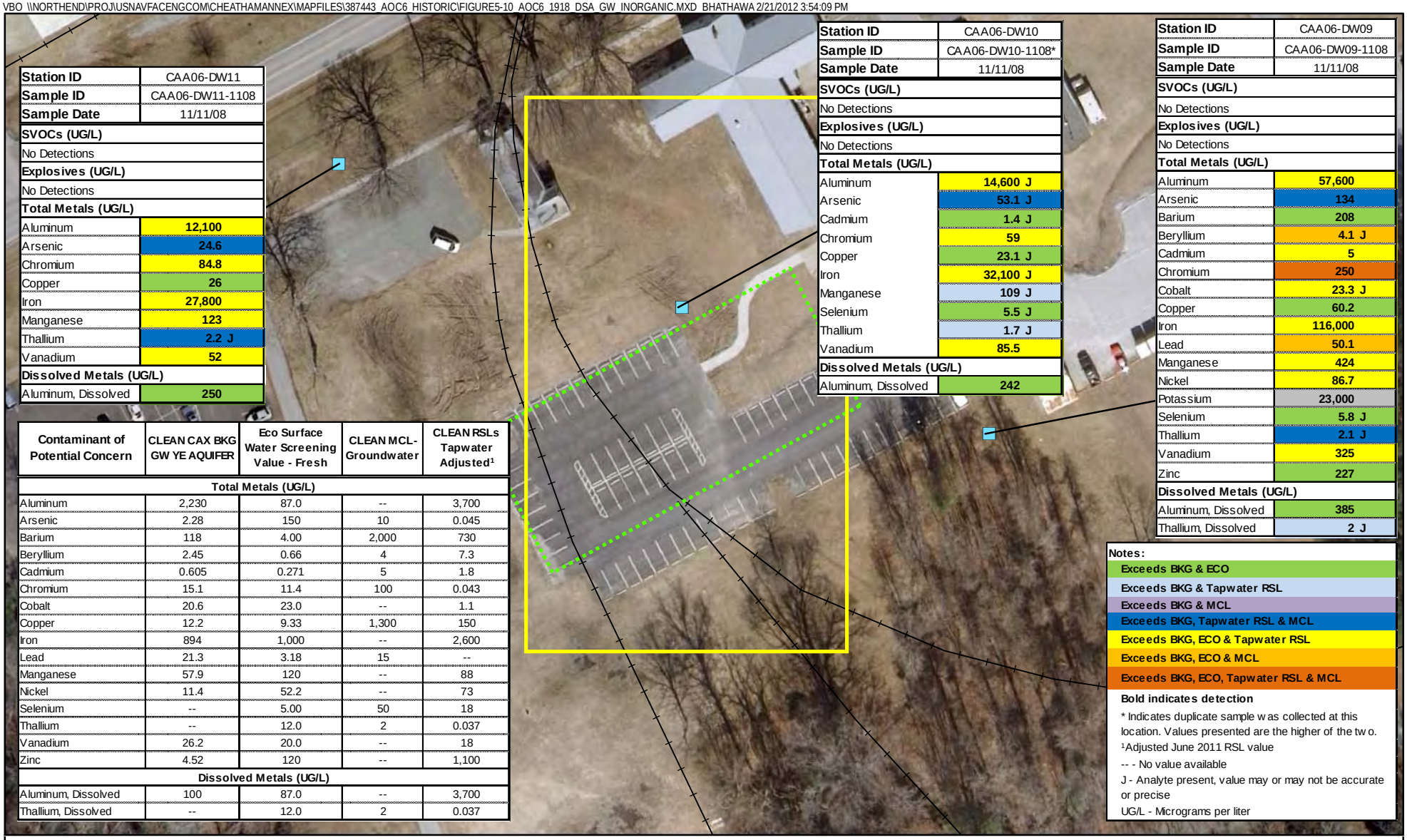
N W E S

0 40 80 Feet

Figure 5-9
AOC 6 Subsurface Soil Exceedance Results
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAMANNEX\MAPFILES\387443_AOC6_HISTORIC\FIGURE5-10_AOC6_1918_DSA_GW_INORGANIC.MXD BHATHAWA 2/21/2012 3:54:09 PM



Station ID	CAA06-DW11
Sample ID	CAA06-DW11-1108
Sample Date	11/11/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	**12,100**
Arsenic	**24.6**
Chromium	**84.8**
Copper	**26**
Iron	**27,800**
Manganese	**123**
Thallium	**2.2 J**
Vanadium	**52**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**250**

Station ID	CAA06-DW10
Sample ID	CAA06-DW10-1108*
Sample Date	11/11/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	**14,600 J**
Arsenic	**53.1 J**
Cadmium	**1.4 J**
Chromium	**59**
Copper	**23.1 J**
Iron	**32,100 J**
Manganese	**109 J**
Selenium	**5.5 J**
Thallium	**1.7 J**
Vanadium	**85.5**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**242**

Station ID	CAA06-DW09
Sample ID	CAA06-DW09-1108
Sample Date	11/11/08
SVOCs (UG/L)	
No Detections	
Explosives (UG/L)	
No Detections	
Total Metals (UG/L)	
Aluminum	**57,600**
Arsenic	**134**
Barium	**208**
Beryllium	**4.1 J**
Cadmium	**5**
Chromium	**250**
Cobalt	**23.3 J**
Copper	**60.2**
Iron	**116,000**
Lead	**50.1**
Manganese	**424**
Nickel	**86.7**
Potassium	**23,000**
Selenium	**5.8 J**
Thallium	**2.1 J**
Vanadium	**325**
Zinc	**227**
Dissolved Metals (UG/L)	
Aluminum, Dissolved	**385**
Thallium, Dissolved	**2 J**

Contaminant of Potential Concern	CLEAN CAX BKG GW YE AQUIFER	Eco Surface Water Screening Value - Fresh	CLEAN MCL-Groundwater	CLEAN RSLs Tapwater Adjusted[1]
Total Metals (UG/L)				
Aluminum	2,230	87.0	--	3,700
Arsenic	2.28	150	10	0.045
Barium	118	4.00	2,000	730
Beryllium	2.45	0.66	4	7.3
Cadmium	0.605	0.271	5	1.8
Chromium	15.1	11.4	100	0.043
Cobalt	20.6	23.0	--	1.1
Copper	12.2	9.33	1,300	150
Iron	894	1,000	--	2,600
Lead	21.3	3.18	15	--
Manganese	57.9	120	--	88
Nickel	11.4	52.2	--	73
Selenium	--	5.00	50	18
Thallium	--	12.0	2	0.037
Vanadium	26.2	20.0	--	18
Zinc	4.52	120	--	1,100
Dissolved Metals (UG/L)				
Aluminum, Dissolved	100	87.0	--	3,700
Thallium, Dissolved	--	12.0	2	0.037

Notes:

- Exceeds BKG & ECO
- Exceeds BKG & Tapwater RSL
- Exceeds BKG & MCL
- Exceeds BKG, Tapwater RSL & MCL
- Exceeds BKG, ECO & Tapwater RSL
- Exceeds BKG, ECO & MCL
- Exceeds BKG, ECO, Tapwater RSL & MCL

Bold indicates detection

* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

[1]Adjusted June 2011 RSL value

-- - No value available

J - Analyte present, value may or may not be accurate or precise

UG/L - Micrograms per liter

Legend

- Groundwater/Soil Sample Location
- Approximate 1918 Drum Storage Study Area
- Approximate Location of Paved Parking Lot (November 15, 2007)
- Former Railroad Spurs

N W E S

0 40 80 Feet

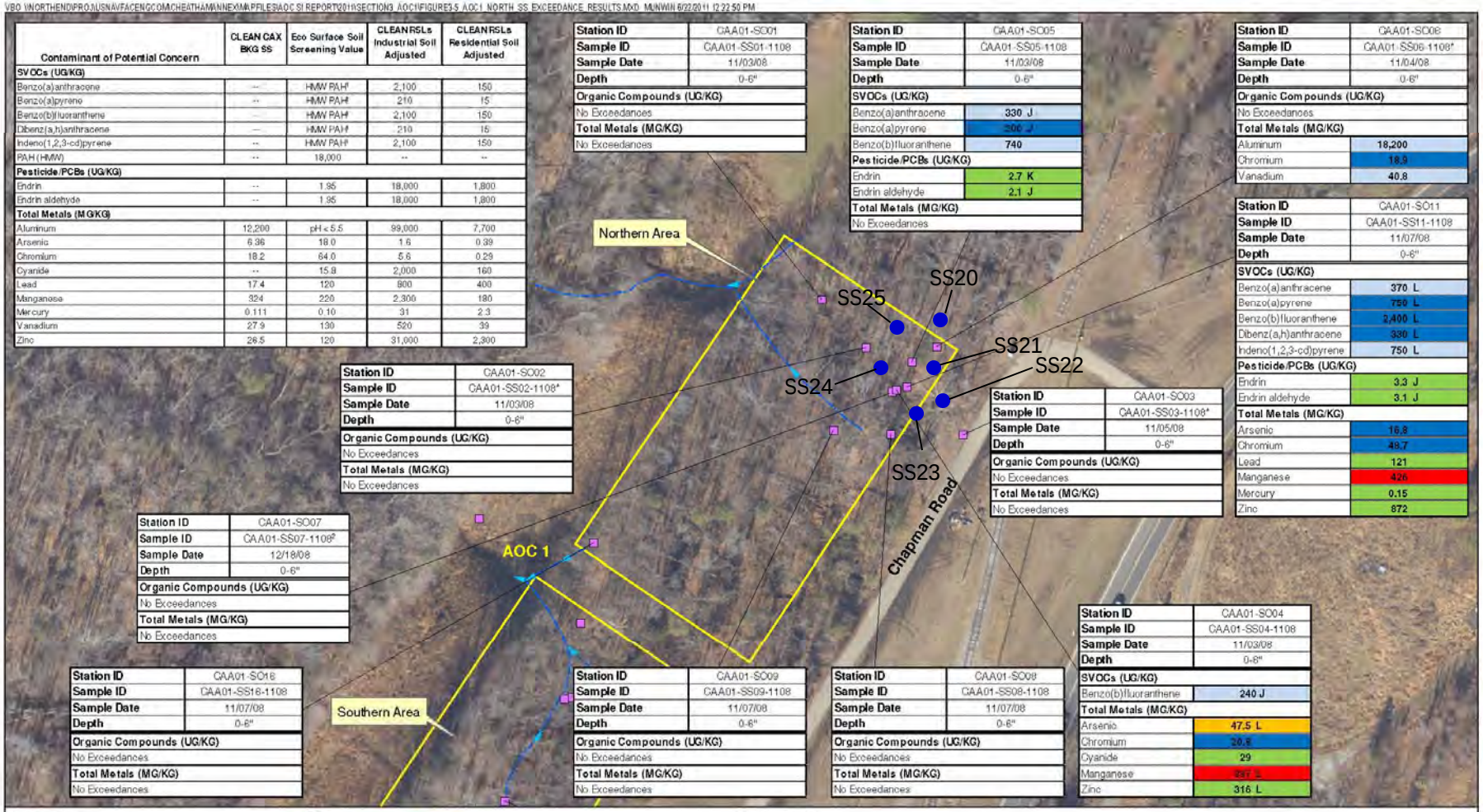
Figure 5-10
AOC 6 Groundwater Exceedance Results
1918 Drum Storage Subarea
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

AOC 1 North ESI
Proposed Surface Soil Sampling Locations

VBO \\NORTHEND\PROJ\USNAVFACENGCOM\CHEATHAM\ANNEX\MXPFILES\AOC SI REPORT\2011\SECTION3_AOC1\FIGURE3-5_AOC1_NORTH_SS_EXCEEDANCE_RESULTS.MXD MUNWIN 6/22/2011 12:22:50 PM

Contaminant of Potential Concern	CLEAN CAX BKG SS	Eco Surface Soil Screening Value	CLEANRSLs Industrial Soil Adjusted	CLEANRSLs Residential Soil Adjusted
SVOCs (UG/KG)				
Benzo(a)anthracene	--	HMW PAH[1]	2,100	150
Benzo(a)pyrene	--	HMW PAH[1]	210	15
Benzo(b)fluoranthene	--	HMW PAH[1]	2,100	150
Dibenz(a,h)anthracene	--	HMW PAH[1]	210	15
Indeno(1,2,3-cd)pyrene	--	HMW PAH[1]	2,100	150
PAH (HMW)	--	18,000	--	--
Pesticide/PCBs (UG/KG)				
Endrin	--	1.95	18,000	1,800
Endrin aldehyde	--	1.95	18,000	1,800
Total Metals (MG/KG)				
Aluminum	12,200	pH < 5.5	99,000	7,700
Arsenic	6.36	18.0	1.6	0.39
Chromium	18.2	64.0	5.6	0.29
Cyanide	--	15.8	2,000	160
Lead	17.4	120	800	400
Manganese	324	220	2,300	180
Mercury	0.111	0.10	31	2.3
Vanadium	27.9	130	520	39
Zinc	26.5	120	31,000	2,300



Station ID	CAA01-SO01
Sample ID	CAA01-SS01-1108
Sample Date	11/03/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO05
Sample ID	CAA01-SS05-1108
Sample Date	11/03/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	330 J
Benzo(a)pyrene	300 J
Benzo(b)fluoranthene	740
Pesticide/PCBs (UG/KG)	
Endrin	2.7 K
Endrin aldehyde	2.1 J
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO06
Sample ID	CAA01-SS06-1108*
Sample Date	11/04/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
Aluminum	18,200
Chromium	18.9
Vanadium	40.8

Station ID	CAA01-SO11
Sample ID	CAA01-SS11-1108
Sample Date	11/07/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(a)anthracene	370 L
Benzo(a)pyrene	750 L
Benzo(b)fluoranthene	2,400 L
Dibenz(a,h)anthracene	330 L
Indeno(1,2,3-cd)pyrene	750 L
Pesticide/PCBs (UG/KG)	
Endrin	3.3 J
Endrin aldehyde	3.1 J
Total Metals (MG/KG)	
Arsenic	19.8
Chromium	49.7
Lead	121
Manganese	426
Mercury	0.15
Zinc	872

Station ID	CAA01-SO02
Sample ID	CAA01-SS02-1108*
Sample Date	11/03/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO03
Sample ID	CAA01-SS03-1108*
Sample Date	11/05/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO07
Sample ID	CAA01-SS07-1108[2]
Sample Date	12/18/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO04
Sample ID	CAA01-SS04-1108
Sample Date	11/03/08
Depth	0-6"
SVOCs (UG/KG)	
Benzo(b)fluoranthene	240 J
Total Metals (MG/KG)	
Arsenic	47.5 L
Chromium	20.8
Cyanide	29
Manganese	297 L
Zinc	316 L

Station ID	CAA01-SO16
Sample ID	CAA01-SS16-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO09
Sample ID	CAA01-SS09-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Station ID	CAA01-SO08
Sample ID	CAA01-SS08-1108
Sample Date	11/07/08
Depth	0-6"
Organic Compounds (UG/KG)	
No Exceedances	
Total Metals (MG/KG)	
No Exceedances	

Legend

- Soil Sample Location
- Approximate AOC 1 Study Area
- Unnamed Tributary
- **Proposed Surface Soil Sample Locations (SS20 – SS25)**

Notes:
- Exceeds BKG & ECO
- Exceeds BKG & Res RSL
- Exceeds BKG, ECO, Res & Ind RSLs

[1]No value for the individual PAH was used; the constituent was evaluated as part of the total PAH (HMW) evaluation.
[2]Sample re-collected on 12/18/08 and analyzed for pesticides/PCBs since these analyses were inadvertently omitted when the sample collected on 11/5/08 was analyzed.
* Indicates duplicate sample was collected at this location. Values presented are the higher of the two.

-- - No value available
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
UG/KG - Micrograms per kilogram
MG/KG - Milligrams per kilogram

N W E S

0 80 160 Feet

AOC 1 North Surface Soil Exceedance Results
Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Cheatham Annex
Williamsburg, Virginia

CH2MHILL

8 – USEPA's Additional Comments on the Draft Final SI Report

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

February 28, 2012

Ms. Krista Parra
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Comments on the Draft Site Inspection Report: Areas of Concern 1,2,6,7 and 8.

Ms. Parra:

Thank you for the opportunity to review the subject document. EPA would like to provide the following comments at this time.

Response to EPA RPM Comment 1: Thank you for the figures. The only additional concern I have is the area should be sampled for PCBs due to the 1918 photograph showing a "Transformer" at the site and its relatively close proximity to Penniman Lake.

Response to EPA RPM Comment 6: The processes/processing remains somewhat uncertain. Additional samples should be collected around the Ammonia Evaporating and Ammonia Settling areas.

Response to EPA Comment 7: I am concerned about the discussion of a "basewide hex chrome number" and the intentions of its use. Although the data is valuable and should provide us with some insight regarding the chromium speciation, this is not meant to be a supplemental background dataset.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

9 – Navy's Response to USEPA's Additional Comments on the Draft Final SI Report

Additional Response To Comments

Draft Final Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA

February 28, 2012

Comments received by email on February 28, 2012 from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3 following review of the previous response to comments on the draft final site inspection (SI) report submitted February 24, 2012 via email.

Comment on Response to EPA RPM Comment 1: *Thank you for the figures. The only additional concern I have is the area should be sampled for PCBs due to the 1918 photograph showing a "Transformer" at the site and its relatively close proximity to Penniman Lake.*

Response: To address this concern, sampling for PCBs near the former Transformer can be added to the Penniman Lake SI/RI and no changes to the recommendations/conclusions for the AOC 6 1918 Drum Storage Area in the SI Report are necessary.

Comment on Response to EPA RPM Comment 6: *The processes/processing remains somewhat uncertain. Additional samples should be collected around the Ammonia Evaporating and Ammonia Settling areas.*

Response: The CAX Partnering Team will discuss adding soil sampling locations to the ESI sampling plan for the AOC 6 Ammonia Settling Pits subarea during the March 2012 Partnering meeting. No change to the SI Report is necessary.

Comment on Response to EPA Comment 7: *I am concerned about the discussion of a "basewide hex chrome number" and the intentions of its use. Although the data is valuable and should provide us with some insight regarding the chromium speciation, this is not meant to be a supplemental background dataset.*

Response: To clarify, the "basewide" hex chrome number is not meant to replace the background UTL. The "basewide" hex chrome number is just a number that can be used to speculate the likelihood of hex (or trivalent) chromium being present in site soil.

10 – Navy's Revision to Responses for USEPA's Additional Comments on the Draft SI Report

Additional Response To Comments

Draft Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8

Naval Weapons Station Yorktown Cheatham Annex
Williamsburg, VA

January 3, 2012
(Revised 4/30/12)

Initial and additional comments were received by email on August 15, 2011 and December 2, 2011, respectively, from John Burchette, U. S. Environmental Protection Agency (USEPA) Region 3. The Navy's initial and additional responses were provided October 4, 2011 and January 3, 2012, respectively. (A correction to the response for Comment 34 was necessary, as well as, EPA agreement on the response to Comment 35; both were added May 21, 2012.)

Comment provided via emai (8/15/11)l: *I have a number of issues with this. Although the general HH Risk screening process provided in appendix A is generally an acceptable and common approach, the document doesn't necessarily follow the process. Many of the chemicals are screened out based on inappropriate screening techniques (inconsistent with EPA Guidance) or judgment calls and not based on scientific evidence. While judgement call may be an acceptable way of proceeding as a site progresses through the CERCLA process, the high level of uncertainty (limited sample coverage) associated with a PA/SI makes these decisions premature.*

Response (10/4/11): The human health and ecological risk screenings conducted were carried out under the current USEPA and/or Navy ERA guidance. Based on a review of the available SI analytical data, the proposed paths forward for the various AOCs followed a logical scientific decision analysis and were not based on opinion. While there will always be a certain amount of uncertainty associated with any PA/SI, the Navy believes that the proposed recommendations were made based on sound scientific evidence; for those AOCs where uncertainty exists, further investigation has been proposed.

EPA Email Response (12/2/11): Noted

EPA RPM General Comment 1 (8/15/11): *There are a multiple instances in this document that are inconsistent with EPA Guidance and some revisions will need to be made or an explanation should be provided as to why they would be appropriate. Examples would be: averaging groundwater samples, applying dilution attenuation factors directly to groundwater samples (typically DAFs are used for and applied to soil migration to groundwater), screening risks from individual chemical against the 5x10-5 cancer and 0.5 HQ screening level (should be cumulative risk for the site not on a per chemical basis), and taking the mean HQ of soil samples and screening them out.*

Further, much of the above is not consistent with the Human Health Screening Methodology (A.2) in Appendix A of this document.

Response (10/4/11): The ecological risk screening methodology was outlined in Appendix B, Section B.2, on which there were no comments. Three of the four examples provided in the comment appear to apply to the ecological screenings. The rationale for using mean groundwater concentrations and dilution factors (not DAFs) in the refined step of the ecological groundwater screenings, and mean soil concentrations in the refined step of the ecological soil screenings, are provided in Appendix B, Section B.2. None of the methods used are known to be precluded in EPA or Navy ERA guidance.

In terms of the HHRA, the only time the average groundwater (or soil) concentration is used is when considering lead. This is because the method used to evaluate lead (the IEUBK model) uses the average concentration of lead as the input value for the model. The identification of the potential for carcinogenic risk or hazard is based on the cumulative risk and cumulative hazard (per target organ). However, to understand which constituents contribute the most to these cumulative risks or hazards, we do point out if individual constituents exceed these levels or not, but it is not used to identify if the site may pose an unacceptable risk or hazard or not. These discussions are presented to supply further information about the site and potential contamination detected at the site.

EPA General Comment 1 Response (12/2/11): EPA's initial belief was that the sole purpose of the report was to determine whether further action would be needed at these AOCs. EPA BTAG will now be reviewing the document and appendices due to the potential ramifications of the report (eliminating COPC etc…).

Additional Response (1/3/12): Noted. Also, please note that the draft final document reflects items (e.g., no longer comparing results to maximum background values; explaining the substitute values used when a constituent does not have an ecological screening value; etc.) from the October 26, 2011 and November 7, 2011 conference calls and the November 2011 Partnering meeting discussion. While a refinement of the COPCs (Step 2b) is presented in the report, the recommendations for each AOC (Step 3) are adequate. For example, Step 2b for AOC 8 surface soil did not retain chromium and arsenic as COPCs, based on the argument that chromium was evaluated as hexavalent but is likely in the trivalent form; however, an RI is the recommend path for AOC 8, including collecting soil samples for inorganic analysis.

EPA RPM General Comment 2 (8/15/11): *A number of chemicals which did not have screening values were screened out by being compared to screening values of other similar explosives. Please provide the actual compound they were compared to, the actual screening value used, and how that number was developed. Please revise each instance of this in the document for transparency purposes (note that not all instances of this are noted in the comments).*

Response (10/4/11): For the ecological screenings, there were five instances (all in soil) where this occurred. In these cases, the soil concentrations for the explosives without a screening value were compared with the range of screening values for all other explosives with such values. These values, which are provided in Table B-1, ranged from 2,260 to 80,000 µg/kg (not including perchlorate, which is not technically an explosive). This explanation will be added to the bullets for the five relevant occurrences.

EPA General Comment 2 Response (12/2/11): See EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1. In addition, the explanations have been added to the draft final.

EPA RPM General Comment 3 (8/15/11): *Please include risk screening tables similar to the Example Risk Screening tables (attached) at the end of each Section for transparency purposes. These tables should include all COPCs that passed through the screening process.*

Response (10/4/11): Summary tables listing the COPCs that passed through the screening process at each AOC are included as the final table in each AOC section of the report. Specifically, these COPCs are included in the Decision Summary tables, which include Tables 3-7, 4-4, 5-12, 6-4, and 7-4.

The Decision Summary tables were prepared to consolidate the results of the human health and ecological risk screenings steps. Detailed tables listing the risk screening calculations are included in Appendices A and B.

Since all of the COPCs that passed through the screening process are included in the general Decision Summary tables, as well as in detail within Appendices A and B, the Navy believes that no revision of the risk screening tables is necessary.

EPA RPM General Comment 3 Response (12/2/11): ok

Section 2

EPA RPM Comment 1 (8/15/11): *Page 2-1. Although the investigation methodology etc… from the previous investigation are not included in the report, I assuming all sample data are. Correct?*

Response (10/4/11): The available historical sample data from previous investigations at AOC 1, AOC 2, AOC 6, and AOC 8 are included in Appendix G, Historical Analytical Data. For clarification, the text on page 3-3 will be revised to state:

"With the exception of arsenic (7.4 mg/kg) in sediment, only low, estimated levels of phthalates, ethylbenzene and xylenes near reporting limits were detected in historical surface water and sediment samples (**Tables G-3 and G-4, Appendix G**)."

EPA RPM Comment 1 Response (12/2/11): Please indicate whether the data was included in the risk evaluation.

Additional Response (1/3/12): The report text has been revised to identify the data that was included in the risk evaluations by adding the following sentence to the end of the 3rd paragraph on page 2-1:

"With the exception of the AOC 2 historical data, only the 2008 SI analytical data were used in the human health and ecological risk screenings conducted for AOCs 1, 6, 7, and 8."

Section 3

EPA RPM Comment 2 (8/15/11): *Page 3-13. This is an incorrect application of dilution attenuation factors. DAF are utilized the project what we may see in groundwater from a soil sample value. Applying a DAF directly to a groundwater sample makes no sense and is not consistent with EPA guidance. Please revise.*

Response (10/4/11): These are dilution factors, not DAFs, as described in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 2 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 3 (8/15/11): *Page 3-15. Groundwater. It is unclear as to why we would average groundwater samples. Wells should be evaluated on a per well basis.*

Response (10/4/11): The rationale is provided in Appendix B, Section B.2. Please see the response to General Comment 1.

EPA RPM Comment 3 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 4 (8/15/11): *Page 3-17. Eco Risk Evaluation. Eco Risks should be calculated for these sites. Although the size of the sites may be small, they are essentially all habitat (forested cover etc… not a parking lot).*

Response (10/4/11): Potential ecological risks were evaluated for these sites, as provided in Section 3.2.4 and Appendix B. The page referenced in the comment provides a summary of the results. The small size of the sites was included as a factor explaining why the risks are likely to be low (i.e., they would be limited, spatially). Consideration of such factors is consistent with the ecological risk screening methodology provided in Appendix B, Section B.2.

EPA RPM Comment 4 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please note that the Step 3 recommendation does include sampling for inorganics, which covers all of the COPCs for ecological risk at AOC 1, except two - endrin and endrin aldehyde. The highest detections of endrin (3.3J µg/kg) and endrin aldehyde (3.1J µg/kg) in the AOC 1 surface soil are slightly above the ecological screening value (1.95 ug/kg for both) and are well below 50 µg/kg, indicating normal pesticide application.

EPA RPM Comment 5 (8/15/11): *Page 3-17. It is highly unlikely that an Arsenic hit of nearly 50ppm at CAA01-SO04 from Table 3-1 is attributed to background. This is almost an order of magnitude above our background number. Please carry Arsenic through as a COPC.*

Response (10/4/11): While the maximum arsenic concentration of 47.5 L mg/kg in surface soil at CAA01-SO04 exceeded the respective base background UTL for arsenic (6.36 mg/kg) by almost an order of magnitude, the maximum arsenic concentration in this sample did not exceed the maximum base background for arsenic (63.9 mg/kg). As such, the maximum concentration detected in surface soil is likely attributable to natural background conditions, as documented in the first bullet on page 3-5. Based on this information, arsenic was not carried through as a COPC during the risk screening process.

EPA RPM Comment 5 Response (12/2/11): EPA does not agree with eliminating Arsenic as a COPC as part of a SI risk screening process. Please carry through arsenic as a COPC or elevate the issue to tier 2.

Additional Response (1/3/12): As agreed to by the Partnering Team on Nov. 16, 2011, the SI analytical data will not be compared against the maximum background UTLs. The text in Sections 3.2.4, 3.3.2 and 3.3.3 has been revised to remove the former maximum background argument, and arsenic and chromium are now identified as COPCs.

(NOTE: Comment 6 was not provided by the USEPA. Comments proceeded from Comment 5 to Comment 7)

Section 4

EPA RPM Comment 7 (8/15/11): *AOC 2 should be considered a solid waste landfill which would be subject to Virginia State regulations.*

Response (10/4/11): AOC 2 is excluded from regulation under 9 VAC 20-81 by 9 VAC 20-81-35(E) and 9 VAC 20-81 45(B)(2)(f) since it is being remediated under CERCLA and ceased disposal operations prior to regulation.

EPA RPM Comment 7 Response (12/2/11): Noted.

EPA RPM Comment 8 (8/15/11): *Page 4-3. A number of drums were found in the area of AOC2TT05-AOC2TT10, AOC2TT13 and AOC2TT14, yet no samples were collected in this area according to Figures 4-4, 4-5, and 4-6. Please collect samples from this area.*

Response (10/4/11): As documented in Attachment B of the *Final Trenching Letter Report, Site 1, Site 4, and AOC 2* (Baker, 2002), empty 55-gallon drums were observed only in test

trenches AOC2TT13 and AOC2TT14; no drums were observed in test trenches AOC2TT05 through AOC2TT10. No samples were collected during the most recent AOC 2 field investigation in 2001.

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 (Figures 4-4 and 4-5). Prior to finalization of the Final SI Work Plan, during a phone conversation with CH2M HILL, the Navy RPM, and USEPA on September 12, 2008, the USEPA agreed that no additional sampling at AOC 2 was required during the SI as long as the respirator cartridges were removed. The Navy agreed, and as documented in the Response to Comments on the Draft Final Work Plan submitted to the WPNSTA Yorktown/CAX Partnering Team, "…the Navy plans on conducting a removal action to address the existing respirator cartridges, …".

Test trenches AOC2TT13 and AOC2TT14 are located within Area 2 that contains the respirator cartridges (Figures 4-4 and 4-5) that will be removed during an EE/CA that will be performed at AOC 2. Since confirmation sampling is planned as part of the EE/CA, the Navy believes sampling of the area where the drums were observed is not necessary.

EPA RPM Comment 8 Response (12/2/11): The text currently states, "In eight of these trenches (AOC2TT05 through AOC2TT10, AOC2TT13, and AOCTT14) dextrose bottles, some clothing, metal debris, and empty 55-gallon tar coated drums were observed". If drums were only found in two locations, please revise the text. Soil samples should be collected beneath the location of the drums. This can be done as part of the confirmation samples following the removal action discussed on page 4-12.

Additional Response (1/3/12): The drums were only found at two of the test trench locations, AOC2TT13 and AOC2TT14. The text has been revised as follows:

"In six of these trenches (AOC2TT05 through AOC2TT10) dextrose bottles, some clothing, and metal debris were observed and empty 55-gallon tar-coated drums were observed in trenches AOC2TT13 and AOC2TT14."

The locations of test trenches AOC2TT13 and AOC2TT14 are within Area 2 recommended for an interim removal action. As requested, confirmation sampling will be conducted beneath the two locations where the empty drums were observed.

EPA RPM Comment 9 (8/15/11): *Page 4-5. "Not considered a CERCLA Source". This is still improper disposal which would be subject to Virginia State regulations.*

Response (10/4/11): The debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes and are not CERCLA-related wastes. Under 9VAC20-81-45(B)(2)(f), the open dump criteria does not apply to sites that are undergoing remediation per the requirements of CERCLA or the RCRA Corrective Action Program and are doing so with the department's and/or the Environmental Protection Agency's oversight. At this time, the Navy believes that the CERCLA action being taken at AOC 2 constitutes sufficient remedial action for the non-CERCLA wastes that were disposed of at the site.

EPA RPM Comment 9 Response (12/2/11): ok

EPA RPM Comment 10 (8/15/11): *Page 4-6. The PCB discussion states that PCBs were detected above residential screening at the duplicate of A2-TP01, but then goes on to say that Aroclor 1260 was not detected in the soil at A2-TP01. Presumably the original A2-TP01 and its' duplicate were taken from the same location and not separate samples correct? I do realize it is possible for an original sample and a dup. to have different detections, but the paragraph implies one sample was within the waste and one was from the native soil below the waste. Also, it appears an interim removal action will be prepared to remove the waste from Area 2. This should be used as the rationale as to why the Aroclor 1260 detection is not of concern. Confirmation samples following the removal should include PCB analysis due to a high degree of uncertainty associated with the contaminants distribution.*

Response (10/4/11): The report text will be revised to clarify the PCB detection as follows:

"One PCB (Aroclor-1260) was detected in only one subsurface soil sample (310 µg/kg in the duplicate A2-TP01**F at Test Pit TP01**), slightly above the residential RSL (220 µg/kg) (Figure 4-7). However, the primary sample from this location was below screening criteria. **Both of** these subsurface soil samples**, A2-TP01F and its duplicate,** were collected within the debris zone at approximately 3.5 feet bgs. **However,** Aroclor-1260 was not detected in the native soil sample (A2-TP01**N**) collected from the bottom of Test Pit TP01 at 5 feet bgs. Therefore, Aroclor-1260 is likely a localized occurrence and not migrating from the debris material. PCBs tend to bind to soil and are not readily mobile."

While the interim removal action at AOC 2 precludes the Aroclor 1260 detection from being a concern, the interim removal action for AOC 2 is not introduced in the report until p. 4-12. Since mention of this removal action on p. 4-6 would disrupt the logical progression of information being presented in Section 4, this rationale has not been included on p. 4-6.

EPA RPM Comment 10 Response (12/2/11): ok

(NOTE: Comment 11 was not provided by the USEPA. Comments proceeded from Comment 10 to Comment 12)

EPA RPM Comment 12 (8/15/11): *According to Figure 4-3 there is a "Significant Geophysical Anomaly" in the North West corner of the site that was not investigated.*

Response (10/4/11): Noted. During the 1998 geophysical investigation, a significant metallic response was identified in the EM-61 data in the northwest corner of the AOC 2 geophysical investigation area, as shown in Figure 4-3 of the SI report. However, as documented in Appendix A of the Final Field Investigation Report, Site 1 and AOC 2 (Baker, 1999), this anomaly was not identified as an anomaly that could not be explained by a surface object. Furthermore, the EM-31 quadrature data for AOC 2, also collected during the 1998 geophysical investigation, complemented most of the EM-61 and in-phase responses, but with less resolution. Based on review of the EM-31 data, "increases in terrain conductivity can be seen along the entire western edge of the grid. Although there are no metallic anomalies corresponding to this

feature it was suggested by Baker personnel on site that this is the possible location of an abandoned railroad. The changes in terrain conductivity may be due to a nonmetallic but relatively conductive material that was used for the railroad bed" (Baker, 1999). While the Final Field Investigation Report does not state specifically why this northwest area was not investigated, it is assumed that the northwest anomaly was likely associated with the abandoned railroad bed.

EPA RPM Comment 12 Response (12/2/11): ok

EPA RPM Comment 13 (8/15/11): *Areas 1b and Area 3 are dumps that don't appear to have to have been sampled according to the figures. Please provide rationale in a RTC as to why this would be acceptable. Presumably the response would be the types of materials disposed would not be expected to create contamination, however, it is highly that any disposing that occurred was an orderly disposal of specific material. Environmental sampling should be conducted to ensure there was no disposal of hazardous materials.*

Response (10/4/11): Based on the AOC 2 test pit and test trenching logs, the debris in Area 1b and Area 3 consists of dextrose bottles, deer carcasses, and military clothes, which are not CERCLA-related wastes. No debris or waste was observed during the trenching activities to propose that hazardous materials were disposed at AOC 2. As such, the Navy does not believe that environmental sampling is necessary.

EPA RPM Comment 13 Response (12/2/11): ok

Section 5
EPA RPM Comment 14 (8/15/11): *Page 5-4. 1918 Drum Storage Area. EPA suggests samples are collected and analyzed for VOCs, PCBs and Pesticides.*

Response (10/4/11): The constituents sampled for and analyzed during the CAX AOC SI, as listed in the Final SI Work Plan agreed to by the WPNSTA Yorktown/CAX Partnering Team, were based on the review of constituents detected during Weston's 1999 Site Inspection. As documented in the WPNSTA Yorktown/CAX Partnering Team Final 15 November 2007 Meeting Minutes, Rob Thomson (USEPA) requested that phthalates be added to the list of analytes to be sampled at AOC 6 during the SI. As such, SVOCs were added to the Final SI Work Plan. Based on the re-review of the 1999 and current AOC 6 SI analytical data, the Navy believes that no additional sampling and analysis for VOCs, PCBs, and Pesticides at the 1918 Drum Storage Area is necessary.

EPA RPM Comment 14 Response (12/2/11): Is there any historical evidence that suggests no drums or barrels containing any VOCs, PCBs, or Pesticides were not stored in this area (or is there any historical evidence to suggest what was stored onsite)?

Additional Response (1/3/12): Presently, no historical evidence has been found documenting the contents of the drums or barrels in the 1918 Drum Storage Area. Based on a power point presentation dated January 2004 ("Cheatham Annex Penniman AOC Desk Top Study & Discussion Update",

unknown author), a review of a 1918 photograph indicates that wooden kegs, stacked on sides and empty, are observed. Additionally, the kegs were stored while the shell loading area was active and "Amatol records similar kegs used for storing Ammonium Nitrate".

No documentation has been found verifying whether or not ammonium nitrate was originally stored in the wooden barrels observed in the 1918 Drum Storage Area. However, explosives were not detected in any of the surface soil, subsurface soil, or groundwater samples collected and analyzed during the 2008 SI.

EPA RPM Comment 15 (8/15/11): *Page 5-10. Bis(2-ethylhexyl)phthalate. If the contaminant was likely attributed lab contamination, was it detected in the blanks?*

Response (10/4/11): The SVOC Bis(2-ethylhexyl)phthalate was not detected in any of the blanks and was inadvertently identified as exceeding the ecological screening value in the pre-Draft report, which listed the Screening Level Concentration (SCL) screening values as the eco screening criteria for sediment. The organic chemicals in sediment were actually screened against both SCL screening values and Equilibrium Partitioning (EqP) screening values (adjusted based upon the mean site-specific total organic carbon concentration), if available, as listed in Appendix B, Table B-3. While the pre-draft tables included the SLC as the ecological screening value, the EqP was the actual screening value used for bis(2-Ethylhexyl)phthalate detected in the AOC 6 sediment samples, as listed in Table 5-11.

Specifically, as documented in Appendix B, pp. B-12 through B-13, Bis(2-ethylhexyl)phthalate exceeded the SLC screening value, but not the EqP screening value, based upon the maximum detected concentration. However, neither of these screening values was exceeded in the field duplicate of the one sample that exceeded the SLC screening value (the chemical was not detected in the field duplicate at a reporting limit less than the SLC screening value). Because the EqP screening value accounts for site-specific bioavailability and was not exceeded, this chemical was not identified as an initial COPC.

The text on p. 5-10, carried over from the pre-draft, inadvertently includes the SCL instead of the EqP. Based on this information, Bis(2-ethylhexyl)phthalate was not an initial COPC. Only one SVOC, 2,6-Dinitrotoluene, initially exceeded the ecological screening criteria. The text will be revised to state the following:

"SVOCs and Explosives

One SVOC, **2,6-Dinitrotoluene**, exceeded the **Equilibrium Partitioning (EqP) value of 187** µg/kg in one **sub**surface sediment sample (**SD02**, near the **Ammonia Settling Pits**) at a concentration of **260 µg/kg.** However**, since the mean HQ for 2,6-Dinitrotoluene was less than one, this constituent was not identified as a refined COPC during the ecological risk screening**. No other SVOCs or explosives exceeded their respective screening criterion in surface and --subsurface sediment samples."

EPA RPM Comment 15 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 16 (8/15/11): *Page 5-12 Ammonia Settling Pits. Check with Rob to make sure the correct chemicals were analyzed for.*

Response (10/4/11): No response necessary. As instructed by the USEPA via email on August 23, 2011, this comment was a note by the USEPA reviewer and should be disregarded.

EPA RPM Comment 16 Response (12/2/11): ok

EPA RPM Comment 17 (8/15/11): *Page 5-13. Ammonia Settling Pit. Groundwater Discussion. Averaging groundwater samples is not acceptable. See RPM General Comment.*

Response (10/4/11): The methodology used to screen and evaluate lead in the HHRS was described in Appendix A, page A-3, as follows "Lead is not evaluated in the same manner as the other COPCs, but is regulated by USEPA based on blood-lead uptake using a physiologically based pharmacokinetic model called the Integrated Exposure Uptake Biokinetic (IEUBK) Model. As a screening tool, lead is screened at 400 mg/kg in soil based on residential exposure. The model uses the average lead concentration, not the maximum detected lead concentration. If the average lead concentration is greater than 400 mg/kg, it is retained as a COPC for the AOC. For groundwater, the maximum detected concentration of lead is screened at 15 µg/L in groundwater based on the federal action level (USEPA, 2009a). If the lead concentrations are greater than the action level, it is retained as a COPC for the AOC." The use of the average lead concentration is consistent with EPA guidance, as the average concentration is the concentration that is used when lead is evaluated using the IEUBK model.

EPA RPM Comment 17 Response (12/2/11): The maximum detect of lead in groundwater of 22 ug/L exceeds the federal action level. If the detection of lead was from a total metals analysis (and either not detected in the dissolved analysis or detected below the action level), then the case can be made for not carrying lead through as a COPC. However, this case is not presented above.

Additional Response (1/3/12): Lead was not detected in the dissolved phase and a sentence to clarify this has been added to the referenced section. Regardless, the recommended path forward for the Ammonia Settling Pit is to conduct an ESI for groundwater, to include permanent monitoring wells and inorganics analysis, so lead will be evaluated again.

EPA RPM Comment 18 (8/15/11): *Page 5-17. Mean HQ for Aluminum and Lead. See RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 18 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 19 (8/15/11): *Page 5-17. DAF applied directly to groundwater sample. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 19 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 20 (8/15/11): *Page 5-18. Mean HQ for HMX and Mercury. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 20 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 21 (8/15/11): *Page 5-18. Groundwater discussion. Please see EPA RPM General Comment 1.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 21 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 22 (8/15/11): *Page 5-19. Surface Soil. Bullets 1, 2, and 3. See EPA RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 22 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 23 (8/15/11): *Penniman Lake Surface Water Discussion. The argument that the screening level of 4ppb for barium is conservative should be overcome by the fact that we*

exceeded it by nearly 5x as well as it being detected at multiple locations. Please refine Barium as a COPC in surface water.

Response (10/4/11): The surface water screening value for barium (4 µg/L) is conservative because it is based upon a form of barium (barium ion) that is relatively uncommon in natural water bodies but very toxic, while the surface water sample was measured for total barium. For comparison, the USEPA Region 5 freshwater screening value for total barium is 200 µ/L, which is much higher than the concentrations found in the lake (which ranged from about 15 to 20 µ/L). This explanation will be added to the text of the SI and barium will not be identified as a COPC.

EPA RPM Comment 23 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1. Also, please note, an RI for Penniman Lake is planned; therefore, any future surface water or sediment work would be conducted under that project and not as part of any follow-up investigation for AOC 6. The Partnering Team discussed and agreed to this approach during November 2011 Partnering.

Section 6
EPA RPM Comment 24 (8/15/11): *Page 6-5. Lead 984ppm. See EPA RPM General Comments.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 24 Response (12/2/11): Additional sampling should take place in the NW portion of the site near CAA07-SO03.

Additional Response (1/3/12): A removal action to address surface soil inorganic contamination around location SO03 is recommended. Confirmation samples will be collected.

EPA RPM Comment 25 (8/15/11): *Page 6-6. Groundwater. Lead. See RPM General Comments.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 25 Response (12/2/11): The maximum detect of lead in groundwater is 31 µg/L which exceeds EPAs screening value for lead. Typically the argument can be made that lead wasn't detected in the dissolved metals analysis. However, it doesn't appear dissolved lead was analyzed (?). Please carry through lead as a COPC, resample the wells for dissolved lead, or elevate the issue to tier 2.

Additional Response (1/3/12): The AOC 7 groundwater samples were analyzed for dissolved lead; however, the concentrations of dissolved lead were all "B" qualified, indicating that lead was not detected above the level reported in the blanks. Based on the average concentration of total lead, 10 ug/L, which is below the 15 ug/L lead screening level, lead was not carried through as a COPC in groundwater at AOC 7. Nonetheless, the recommended path forward for AOC 7 groundwater is an

ESI, including the installation of permanent monitoring wells and inorganic analysis, so lead will be evaluated again.

EPA RPM Comment 26 (8/15/11): *Page 6-7. Subsurface Soil. See RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 2.

EPA RPM Comment 26 Response (12/2/11): Please see EPA General Comment 1 Response.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 27 (8/15/11): *Page 6-8. Groundwater. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 27 Response (12/2/11): Please see EPA General Comment 1 Response

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 28 (8/15/11)*: Page 6-8. Second to last word. Typo.*

Response (10/4/11): Corrected. The second to last word in the final sentence on p. 6-8, "work", has been revised to "word".

EPA RPM Comment 28 Response (12/2/11): Thank you.

EPA RPM Comment 29 (8/15/11): *Former Drum Pile. Was GPR preformed on this AOC (I may have missed it)?*

Response (10/4/11): No, GPR has not been conducted in the vicinity of the Former Drum Disposal Area.

EPA RPM Comment 29 (12/2/11): ok

EPA RPM Comment 30 (8/15/11): *Figure 6-4. From Figure 6-4 it does not appear that the actual nature of the pit has been characterized (although extent appears to have been defined). Since the path forward for the Site is a removal action, the only comment would be to analyze for a full suite of analytes during confirmation samples.*

Response (10/4/11): An expanded SI is recommended for AOC 7 (Drum Disposal and Can Pit Area) in order to verify the groundwater flow directions and to verify and characterize the extent of inorganic contamination. As indicated by the current SI analytical data, no VOCs, SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in soil, and no SVOCs, pesticides, PCBs, or explosives were detected above screening criteria in groundwater. Only one VOC exceeded screening criteria in groundwater.

Prior to preparing the expanded SI work plan, the current SI analytical data will be reviewed and a focused list of analytes will be recommended based on the recent detections.

EPA RPM Comment 30 Response (12/2/11): The "current analytical data" consists of what appears to be only 1 sample within the actual footprint of the can pit. Constituents should not be eliminated based on 1 sample.

Additional Response (1/3/12): Sorry that the previous response discussed the path forward for the AOC 7 groundwater and did not address Comment 30. Yes, there was one sample location within the can pit, from which two soil samples (surface and subsurface) were collected. The footprint of the can pit is rather small (~30 feet long and 20 feet wide); therefore, the sample is representative of conditions and can be considered "worst case scenario." The recommendation for the can pit is a removal action with confirmation sampling. The recommended confirmation sampling is for inorganic constituents, not full suite. The Navy feels it is acceptable to leave the SI recommendations as they are and let the Partnering Team discuss the confirmation sample analyte list during the EE/CA preparation.

Section 7
EPA RPM Comment 31 (8/15/11): *Page 7-7. Mean Zinc. See RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 30 Response (12/2/11): Please see EPA General Comment 1 Response

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

EPA RPM Comment 32 (8/15/11): *Page 7-8. Groundwater. See RPM General Comments.*

Response (10/4/11): Please see the response to General Comment 1.

EPA RPM Comment 32 Response (12/2/11): see the response to General Comment 1.

Additional Response (1/3/12): Noted. Also, please see the "Additional Response" to EPA General Comment 1.

Appendix A
EPA RPM Comment 33 (8/15/11): *Page A-5. AOC 1 South. Lead 698ppm. See EPA RPM General Comment.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment Response 33 (12/2/11): Lead should be stepped out to the East.

Additional Response (1/3/12): The recommended path forward for AOC 1 South is an ESI to further verify and characterize the extent of SVOC (PAHs) and inorganic contamination "hot

spot" areas; therefore, lead will be evaluated again. As far as sample locations are concerned, those details will be worked out during the ESI scoping session and included in the ESI UFP-SAP. The Navy feels it is acceptable to leave the SI recommendations as they are and let the Partnering Team discuss the sample locations during the ESI scoping session.

EPA RPM Comment 34 (8/15/11): *Page A-7. Iron discussion. This doesn't make sense. Although Iron is an essential human nutrient, there is some science that went in to the development HQ and screening values developed. If a chemical is exceeding the screening values we can't say "it is likely that exposure to iron at the concentrations present on the site would not result in any adverse health effects". That is essentially questioning the science that went in to the development of the risk numbers. Please revise.*

Response (10/4/11): We will revise the paragraph discussing iron as follows to indicate that the maximum detected iron concentration would not result in an intake above the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. The following text will be added to Page A-7:

"Iron, the only contributor to the potential noncarcinogenic hazard is considered an essential human nutrient, and although the concentrations indicate a potential unacceptable hazard, it is likely that exposure to iron at the concentrations present on site would not result in any adverse health effects. The potential unacceptable hazard is primarily associated with the iron concentration detected in sample CAA02-A2-DPB03-00-1098. Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 8.8 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 18 mg/day iron (44,000 mg/kg x ingestion rate of 400 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children."

EPA RPM Comment 34 Response (12/2/11): ok

Additional Response (1/3/12): Also note that although the main text may state the exposure to iron is not likely to have adverse effects, iron is carried through as a COPC.

Correction (4/27/12): The original EPA comment and Navy response addresses the iron discussion for the AOC 2 surface soil; however, a similar discussion/revision is also necessary for the AOC 2 subsurface soil. While preparing a similar response for the subsurface soil, the human health risk assessor noticed the ingestion rates were incorrect, and they should be 100 and 200 for adult and children, respectively, and not 200 and 400, as previously reported. Therefore, the correction for surface soil is:

"Ingestion of soil at the maximum detected concentration of iron [44,000 mg/kg, which would result in ingestion of 4.4 mg/day iron for an adult (44,000 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 8.8 mg/day iron (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children."

And the addition for subsurface soil is:

"Ingestion of soil at the maximum detected concentration of iron [45,300 mg/kg, which would result in ingestion of 4.5 mg/day iron for an adult (45,300 mg/kg x ingestion rate of 100 mg/day x conversion factor of kg/10^6 mg]), is below the tolerable upper intake level (UL), the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population of 45 mg/day for adults. Ingestion of iron in soil by children would result in ingestion of 9.1 mg/day iron (44,000 mg/kg x ingestion rate of 200 mg/day x conversion factor of kg/10^6 mg), which is below the UL of 40 mg/day for children."

Also, the above 1/3/12 "Additional Response" is incorrect. Iron is NOT being carried through as a human health COPC in surface or subsurface soil because the daily ingestion rate for adults and children is below the tolerable upper intake level for both media, thus there would be adverse effect. (Note: iron is a COPC for ecological risk in surface and subsurface soil.)

EPA RPM Comment 35 (8/15/11): *Page A-7. Doesn't the RAGs Guidance caution against screening something out (Thallium) because it doesn't have a screening criteria? I believe it should be carried through.*

Response (10/4/11): Thallium was not carried through the screening tables because it was not possible to estimate any contribution to the cumulative hazard/risk associated with thallium. Between the draft and draft final document, the latest RSL update (June 2011) became available, and there are now RSLs for thallium. The thallium detections for all media for all AOCs were compared (not risk screened) to the new thallium RSLs:

- Res. Soil RSL: listed as .78 mg/kg, adjusted value .078 mg/kg
- Ind. Soil RSL: listed as 10 mg/kg, adjusted value 1 mg/kg
- GW Tapwater RSL: listed as .37 µg/L, adjusted value .037 µg/L
- SW RSL: listed as 3.7 µg/L, adjusted value 0.37 µg/L

The thallium concentrations exceeded the respective RSL for these AOCs and media and could potentially be a COPC:

<u>AOC 2</u>:

– Thallium in **SB** - sample CAA02-A2-TP02-N-1999 (0.84 L mg/kg)

- Total thallium in **GW** - samples CAA02-A2DPW01-1098 (1.2 L µg/L) and CAA02-A2DPW02-1098 (2 J µg/L)

<u>AOC 6 – 1918 Drum Storage Area</u>:

- Total thallium in **SB** - sample CAA06-SB16-1108 (0.08 J mg/kg)
- Total thallium in **GW** - samples CAA06-DW09-1108 (2.1 J UG/L), CAA06-DW10P-1108 (1.7 J µg/L), CAA06-DW11-1108 (2.2 J µg/L)
- Dissolved thallium in **GW** - sample CAA06-DW09-1108 (2 J µg/L)
-

<u>AOC 6 TNT Areas</u>:

- Thallium in **SS** – sample CAA06-SS03-1008 (0.18 J mg/kg)
- Thallium in **SW** - sample CAA06-SW01-1008 (1.7 J µg/L)

<u>AOC 8</u>:

- Thallium in **SS** - sample CAA08-SS01-1008 (0.08 J mg/kg)
- Dissolved thallium in **GW** - sample CAA08-DW04-1008 (1.9 J µg/L)

For AOC 2, thallium was not detected in the dissolved metals fraction in groundwater, thus the total results are likely attributable to suspended solids. The subsurface soil location where thallium exceeded the RSL is within the removal area that will be in the interim removal action area. Therefore, no change to the recommendations for AOC 2 is necessary.

For the AOC 6 – 1918 Drum Storage Area, since the SI recommendation was no further action, the human health risk screening for this area was re-run using the June 2011 RSLs (for all constituents, including thallium). Results of the updated risk screening continue to indicate that exposure to surface and subsurface soil within the 1918 Drum Storage Area would not result in any unacceptable risks. While exposure to groundwater could result in potential unacceptable human health risks, associated with exposure to metals, this potential risks is based on total inorganics detected in the groundwater; however, the DPT method generally results in higher total inorganic concentrations from the higher turbidity. Aluminum was the only inorganic detected in the dissolved fraction and is likely attributable to background; therefore, no unacceptable human health risk above background is expected for groundwater. The no further action recommendation is still appropriate and no change to the SI report is necessary.

For the AOC 6 – TNT Areas surface soil, an RI is the recommended path forward for the AOC; thus, thallium will be evaluated as part of the HH risk assessment. Regarding the surface water sample, the total thallium concentration exceeds the surface water screening level (adjusted tap water RSL times ten, 0.37 µg/L), but does not exceed the unadjusted screening level (tap water RSL times ten, 3.7 µg/L). In addition, thallium was not detected in the dissolved fraction. No change to the SI report is necessary.

For AOC 8, the surface soil sample thallium concentration listed above was within the range of the residential RSL (considering significant figures). Regarding the AOC 8 groundwater, an RI is the recommended path forward; thus, thallium will be evaluated as part of the HH risk assessment and no change to the SI report is necessary.

The text in the individual AOC sections and Appendix A (the HH risk screen) will be revised, as appropriate, to reflect that there are now RSLs for thallium and the comparison to them and conclusions presented above. For the AOC 6 Drum Storage Area, the text, tables, and figures will be updated to reflect the revised HH risk screen.

EPA RPM Comment 35 Response (via the EPA's letter dated 5/21/12):

"EPA has reviewed the responses to comments and the in text revisions to the document and has found them to be acceptable."

EPA RPM Comment 36 (8/15/11): *Page A-7. Aroclor-1260. Should be cumulative risk. See EPA RPM General Comments.*

Response (10/4/11): Agree. However, the point of this paragraph is to show that the risk is primarily associated with chromium, based on the assumption that all of the chromium is in the hexavalent form, and to identify the relative contribution from each of the carcinogenic COPCs.

EPA RPM Comment 36 Response (12/2/11): Page A-7 Subsurface soil. I do not understand the point of the final paragraph on page A-7. The prior paragraph states Aroclor 1260, arsenic, chromium, copper and iron were retained as COPCs (which is fine). However, the following paragraph goes on to discuss the individual risk associated with each individual compound stating they are within the acceptable level. (I do not believe the cumulative risk was within the acceptable range? That is the primary issue). For clarification, were Aroclor 1260, arsenic, chromium, copper and iron retained as COPCs?

Additional Response (1/3/12): Yes, they are retained as COPCs (see main text, page 4-12).

EPA RPM Comment 37 (8/15/11): *Page A-10. Ammonia Settling Pit Area. Lead. See RPM General Comments.*

Response (10/4/11): Please see the response to Comment 17.

EPA RPM Comment 37 Response (12/2/11): Please see the Comment 17 Response.

Additional Response (1/3/12): Please see the additional response provided to the Comment 17 Response.

EPA Tox Comment 1 (8/15/11): *In Section 2.4 of the report, the text should confirm that surface and subsurface soil samples were collected from original soil (not fill material), where contamination, if any, would likely be found.*

Response (10/4/11): For clarification, the report text in Section 2.4 will be revised as follows:

"Surface soil samples were collected from **native soil** 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, **non-native** deep subsurface soil samples were collected at AOCs 7 and 8 from the bottom of test pits considered to be most impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris."

EPA Tox Comment 1 Response (12/2/11): Thank you, the response to comment is acceptable.

Additional Response (1/3/12): The above text revision indicates non-native deep subsurface soil samples were collected at AOC 7 and that is not the case, as the vertical extent of waste was delineated at AOC 7. Therefore, the above revision has been further refined as follows:

"Surface soil samples were collected from native soil 0 to 6 inches below ground surface (bgs) and shallow subsurface samples were collected from 6 to 24 inches bgs. In addition, deep subsurface soil samples were collected at AOC 7 (native subsurface soil samples CAA07-SBTP04-1008, CAA07-SBTP06-1008, and CAA07-SBTO05-1008) and AOC 8 (native subsurface soil samples CAA08-SBTP14-1008 and CAA08-SBTP24-1008; non-native soil sample CAA08-SBTP19-1008) from the bottom of test pits considered to be potentially impacted by debris. The purpose of these additional subsurface samples was to determine the potential for vertical migration of contaminants from buried debris."

EPA Tox Comment 2 (8/15/11): *According to Table 2-1, in terms of organics, only TCL SVOCs were considered at AOC 6. Why wasn't the full TCL suite considered? This could represent a data gap. Fortunately, most of the subareas in AOC 6 will move forward for additional investigation; however, the 1918 Drum Storage Area dropped out. Unless strong justification can be provided for this omission, consideration should be given to collecting additional samples from the 1918 Drum Storage Area to rule out the presence of VOCs, PCBs and pesticides in soil.*

Response (10/4/11): Please see the response to Comment 14.

EPA Tox Comment 2 Response (12/2/11): Thank you, the response to comment is acceptable.

EPA Tox General Comment (12/2/11): As we've discussed (both in-house and on a conference call with the Navy), there seems to be a protocol in place for evaluating Cheatham sites at the SI stage. That's fine, assuming that all partners agree with the established decision tree. However, it seems that when sites fail the screening, the Navy introduces additional (and not necessarily scientifically-sound) screening parameters to justify NFA. I understand that no one wants to unnecessarily propel sites into an RI, but we also can't allow sites that pose potentially significant risks to slip through the cracks. Further, if data gaps exist, they need to be filled (perhaps through an Extended SI) before a final conclusion can be drawn. Bottom line, risk management calls should primarily be reserved for situations where a site is well characterized and informed decisions can be made.

Response to New EPA Tox General Comment (1/3/12): From the start of this project, the CAX Partnering Team has discussed and agreed upon the course of action for investigating these AOCs. Along the way, there have been three different Navy RPMs and three different EPA RPMs. It's possible successors did not have a clear understanding of past decisions, but the Navy has not acted as a sole decision agent. This SI evaluates five AOCs, which includes two subareas for one AOC (AOC 1) and four subareas for another (AOC 6). In total, eight areas are evaluated. Of these eight, only two have an NFA recommendation – AOC 2 (groundwater portion only) and AOC 6 1918 Drum Storage subarea (soil and groundwater). We feel sufficient data and scientifically-sound reasons for NFA do exist. In addition, at the November 2011 Partnering meeting, the Team discussed and agreed to conducting a risk assessment using existing data to demonstrate that NFA is appropriate; if there is a data gap, it will be presented and resolved. The SI recommendations are appropriate, and the details of the follow-on work can be ironed out later.

11 – USEPA's Letter of Acceptance

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

May 21, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26, Room 3208
Attention: Code OPHE3, Mr. Scott Park
9742 Maryland Avenue
Norfolk, VA 23511-3095

Subject: Comments on the Draft Site Inspection Report: Areas of Concern 1,2,6,7 and 8.

Mr. Park:

EPA has reviewed the responses to comments and the in text revisions to the document and has found them to be acceptable. EPA has no additional comments on the subject document and it is the opinion of EPA that the document is ready for inclusion in the Administrative Record for the Site. Please send a final version of the document.

If you have any questions, please contact me at 215-814-3378.

Sincerely,

John Burchette
Remedial Project Manager

cc: Wade Smith, VDEQ

12 – VDEQ's Letter of Acceptance

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY
Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 1105, Richmond, Virginia 23218
TDD (804) 698-4021
www.deq.virginia.gov

Douglas W. Domenech
Secretary of Natural Resources

David K. Paylor
Director

(804) 698-4000
1-800-592-5482

May 31, 2012

Mr. Scott Park
NAVFAC MIDLANT, Building N-26
Hampton Roads Restoration Product Line, Code OPHREV4
9742 Maryland Avenue
Norfolk, VA 23511-3095

RE: Final Red-Line Site Inspection Report
Areas of Concern 1, 2, 6, 7, and 8
Naval Weapons Station Yorktown
Cheatham Annex
Williamsburg, Virginia

Dear Mr. Park:

The Virginia Department of Environmental Quality (DEQ) has received the *Final Red-Line Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8* (SI Report) for Naval Weapons Station Yorktown, Cheatham Annex (CAX), Williamsburg, Virginia. The May 2012 SI Report, prepared by CH2M HILL, was received by the DEQ (electronically) on April 30, 2012.

Thank you for providing the DEQ's Office of Remediation Programs the opportunity to review the above-referenced SI Report. Subsequent to DEQ's internal review and per CAX Partnering Team discussions, this office concurs with the proposed text revisions and recommends submittal of the *Final Site Inspection Report, Areas of Concern 1, 2, 6, 7, and 8.*

Please contact me at (804) 698-4125 or wade.smith@deq.virginia.gov with any additional questions.

Sincerely,

Wade M. Smith
Remediation Project Manager
Office of Remediation Programs

cc: John Burchette, EPA